EXHIBIT 1

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF PENNSYLVANIA

VICTAULIC COMPANY, Plaintiff, v. ANVIL INTERNATIONAL, LLC, Defendant.	:	Civil Action No. 5:12-cv-05985-SD

PLAINTIFF'S SURREPLY BRIEF IN OPPOSITION TO DEFENDANT'S MOTION TO DISMISS, OR IN THE ALTERNATIVE, STAY OR TRANSFER PLAINTIFF'S AMENDED COMPLAINT

Contrary to defendant Anvil International LLC's ("Anvil") assertion in its reply brief, Anvil's motion to stay the Northern District of Georgia case is an additional reason to *deny* Anvil's motion to dismiss, stay or transfer this case for at least the following reasons.

The motion to stay is a continuum of Anvil's efforts to hold Victaulic's infringement cause of action in this case hostage to the improperly brought declaratory judgment case in the Northern District of Georgia. Specifically, the Northern District of Georgia case is not a properly brought declaratory judgment action because, at the time the complaint was filed, there was not "a case or controversy" based on "a real and immediate injury or threat of future injury" to plaintiffs that was caused by Victaulic. *See* pages 4-18 of Plaintiff's Brief in Opposition to Defendant's Motion to Dismiss, or in the Alternative, Stay or Transfer Plaintiff's Amended Complaint (docket entry no. 21). By its motion to dismiss, transfer or stay this affirmative infringement case in view of that improperly brought declaratory judgment case, Anvil seeks to hold this case hostage to that improperly brought declaratory judgment case. By its motion to

stay the improperly filed Northern District of Georgia case, Anvil seeks for that situation to continue indefinitely. If the Northern District of Georgia case grants the motion to stay, and this Court strictly follows the first-filed rule, Victaulic's properly brought infringement action against Anvil in this Court will be in indefinite legal limbo, and Anvil's infringement can continue unabated for many years.

The contradictions in Anvil's litigation tactics are clear. In Anvil's efforts to achieve the objective of having Victaulic's infringement cause of action in this case put on an indefinite hold, Anvil and its co-plaintiff in the Northern District of Georgia case, Mueller Water Products, Inc. ("Mueller"), first race to hale Victaulic into court in the Northern District of Georgia, seeking a declaratory judgment because there is allegedly a "real and immediate injury or threat of future injury that is caused by" Victaulic (even though Victaulic's last communication to them stated that Victaulic had no intention of suing until it obtained Anvil's product to test). Then, Mueller and Anvil file a motion to stay *their own case* in the Northern District of Georgia, in contravention of their assertion that they need a declaratory judgment because they are suffering an immediate injury or threat of injury. Courts recognize the inherent contradiction and gamesmanship arising when a party initiates a declaratory judgment action, and then moves to stay that declaratory judgment action. *See, e.g., Sighting Sys. Instruments, LLC v. Prestige Law Enforcement Inc.*, No. 05-1560, 2006 WL 2642184 (N.D. Tex. Sept. 11, 2006) (finding that a stay of a declaratory judgment case asserting patent non-infringement and invalidity is contrary to the purpose of a declaratory judgment case, which is to alleviate the harm caused by the patent owner's threat of infringement.). One Court relied on that improper gamesmanship to deny an agreed-to motion to stay in a patent declaratory judgment action:

> When an accused infringer seeks the protection of the Court's declaratory relief jurisdiction, it should be quick to open its files, saying, "See, we do not infringe."

> It should not fold its arms and say, "Now that we have outmaneuvered you and anchored our dispute in a venue of our choice, we will go very slow in letting you see our files.

Comcast Cable Commc'ns Corp., LLC v. Finisar Corp., No. 06-04206, 2007 WL 1052883, at *2 (N.D. Cal. Apr. 5, 2007). The final step in Anvil's plan is the dismissal, transfer or stay of this case in view of the stayed Northern District of Georgia case.

If the above occurs according to Anvil's plan, Anvil will have used gamesmanship rather than evidence or merit to stop Victaulic from pursuing this properly brought infringement case against Anvil.

Moreover, if the Northern District of Georgia case is stayed, that stay will be indefinite and last many years because Anvil has requested that the Northern District of Georgia case be stayed until all four reexaminations of Victaulic patents that are currently pending in the United States Patent Office are completed. However, as explained in Defendant's Memorandum in Opposition to Plaintiffs Mueller Water Products, Inc. and Anvil International, LLC's Motion for a Stay Pending Reexamination of the Patents-in-Suit in the Northern District of Georgia case (Exhibit 1), a stay until all four reexaminations are completed would last for many years, and, in effect, be indefinite, because of delays in the Patent Office, including possible multiple appeals to the internal Patent Office board of appeals (which has a large backlog), and subsequent appeals to the United States Court of Appeals for the Federal Circuit. Such a stay would leave Victaulic's patent rights vis-à-vis Anvil's infringement in legal limbo during that indefinite time period.

Finally, this Court should deny Anvil's alternative request to stay this case, as that would merely cause the judicial system to retain two cases indefinitely, with the parties neither knowing which forum they are in, nor having a final order to appeal from.

For the reasons set forth above, as well as those presented in Plaintiff's Brief in Opposition to Defendant's Motion to Dismiss, or, in the Alternative, Stay or Transfer Plaintiff's Amended Complaint (docket entry no. 21), this Court should deny Anvil's motion to dismiss, transfer or stay.

Dated: January 24, 2013.

Respectfully submitted,

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Exhibit 1

IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF GEORGIA
ATLANTA DIVISION

MUELLER WATER PRODUCTS, INC. and ANVIL INTERNATIONAL, LLC, Plaintiffs, v. VICTAULIC COMPANY, Defendant.	)	Civil Action No. 1:12-cv-03446-JEC

DEFENDANT'S MEMORANDUM IN OPPOSITION TO PLAINTIFFS MUELLER WATER PRODUCTS, INC. AND ANVIL INTERNATIONAL, LLC'S MOTION FOR A STAY PENDING REEXAMINATION OF THE PATENTS-IN-SUIT

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4	September 28, 2012 letter from Darle M. Short, Esq. (Victaulic's counsel) to Mr. Thomas E. Fish (Anvil) and Mr. Gregory E. Hyland (Mueller)
5	October 11, 2012 Anvil Letter Forwarding SlideLok Samples
6	Anvil's Columbia, Pennsylvania Distribution Center, October 31, 2012
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8	Declaration of Casey J. Schmidt
9	Collection of Victaulic Marketing Materials
10	Declaration of Richard A. Bucher, Ph.D.

I. INTRODUCTION

Plaintiffs' motion to stay should be denied as moot, because this case should be dismissed or transferred for the reasons established in the Corrected Memorandum of Law in Support of Defendant's Motion to Dismiss or, in the Alternative, Transfer and the exhibits to the memorandum (Dkt. 6 and 7). *See Atlantis Hydroponics, Inc. v. Int'l Growers Supply, Inc.*, No. 12-1206, 2013 WL 28102 (N.D. Ga. Jan. 3, 2012) (in a patent declaratory judgment case in which this Court was similarly faced with defendant's motion to dismiss or transfer and plaintiff's motion to stay in view of a pending reexamination of defendant's patent, this Court granted the motion to dismiss/transfer and denied the motion to stay as moot).

On the other hand, if this Court decides to resolve this motion to stay before resolving the motion to dismiss/transfer, or if this Court denies the motion to dismiss/transfer before addressing this motion to stay, the motion to stay should be denied because the requested stay would unduly prejudice defendant Victaulic Company ("Victaulic") and provide an unfair tactical advantage to plaintiffs. Further, a stay until all four reexaminations are completed would last for many years, and, in effect, be indefinite, because of delays in the Patent Office, including possible multiple appeals to the internal Patent Office board of appeals (which has

a large backlog), and subsequent appeals to the United States Court of Appeals for the Federal Circuit, leaving Victaulic's patent rights vis-à-vis plaintiff Anvil International, LLC's ("Anvil") infringement in legal limbo during that indefinite time period.

Addressing first the unfair tactical advantage a stay would provide plaintiffs, by their motion, plaintiffs seek to stay not only this case, but also Victaulic's properly brought infringement action in the Eastern District of Pennsylvania against Anvil (plaintiff Mueller Water Products, Inc. ("Mueller") is not a defendant in the Eastern District of Pennsylvania infringement case), by holding the Eastern District of Pennsylvania case hostage to this stayed case. In their efforts to achieve that objective, plaintiffs take the unusual and contradictory litigation steps of first racing to this courthouse to file a premature declaratory judgment complaint in an attempt to preempt a possible properly brought infringement complaint by Victaulic in the proper Court (the United States District Court for the Eastern District of Pennsylvania), and then asking this Court, when faced with a motion to dismiss or transfer, to stay plaintiffs' attempted preemptive race-to-the-courthouse declaratory judgment lawsuit. Plaintiffs request that this Court stay this case before resolving Victaulic's motion to dismiss or transfer, banking on that if this Court does stay the case before the motion to dismiss or transfer is resolved, the

United States District Court for the Eastern District of Pennsylvania will strictly follow the first-filed rule, and dismiss, transfer or stay its case in view of this case. If the above occurs according to plaintiffs' plan, plaintiffs will have precluded the properly brought infringement case in the Eastern District of Pennsylvania from proceeding because of this motion.

The inconsistency in plaintiffs' litigation strategy is clear. Plaintiffs first represent to this Court, by filing their declaratory judgment complaint, that there is a case or controversy between plaintiffs and Victaulic because there is a "real and immediate injury or threat of future injury that is caused by" Victaulic, which is the standard for patent declaratory judgment actions. *Prasco, LLC v. Medicis Pharm. Corp.*, 537 F.3d 1329, 1339 (Fed. Cir. 2008). Then, despite representing to the Court that there is real and immediate injury or threat of future injury, plaintiffs move to stay the case, which contravenes that there is an immediate injury that is being suffered by plaintiffs or an immediate threat of such injury. *See Sighting Sys. Instruments, LLC v. Prestige Law Enforcement Inc.*, No. 05-1560, 2006 WL 2642184 (N.D. Tex. Sept. 11, 2006) (finding that a stay of a declaratory judgment case asserting patent non-infringement and invalidity is contrary to the purpose of a declaratory judgment case, which is to alleviate the harm caused by the patent owner's threat of infringement.). One Court relied on that inconsistency in denying

an agreed-to motion to stay based on a reexamination in a patent declaratory judgment action:

> When an accused infringer seeks the protection of the Court's declaratory relief jurisdiction, it should be quick to open its files, saying, "See, we do not infringe." It should not fold its arms and say, "Now that we have outmaneuvered you and anchored our dispute in a venue of our choice, we will go very slow in letting you see our files.

Comcast Cable Commc'ns Corp., LLC v. Finisar Corp., No. 06-04206, 2007 WL 1052883, at *2 (N.D. Cal. Apr. 5, 2007). *See also IMAX Corp. v. In-Three, Inc.*, 385 F. Supp. 2d 1030 (C.D. Cal. 2005) (denying motion to stay, in part, because the movant had previously brought a motion for a preliminary injunction requesting immediate action by the Court.)

Turning to the undue prejudice to Victaulic, the products in issue are deformable mechanical pipe couplings. There are currently four markets for that type of coupling. While Victaulic's patented deformable mechanical pipe couplings have made strides in one of those markets, Victaulic is still seeking similar acceptance of its patented couplings in the other three markets. Anvil's infringing SlideLok couplings are for two of those three "unestablished" markets. If the infringing Anvil SlideLok couplings have problems, and there are indications that those couplings will have performance issues (the SlideLok couplings were first introduced in the market in late September 2012), the entire deformable

mechanical pipe coupling market for those industries will likely be tainted because it is likely that persons in those industries will deduce that the problems with the SlideLok couplings are a problem generic to all deformable mechanical pipe couplings, and not just a problem with Anvil's commercial embodiment. If that occurs, those industries will be even more hesitant to buy deformable mechanical pipe couplings from any source, including Victaulic.

Further, there are only two deformable mechanical pipe couplings on the market - Victaulic's patented coupling and Anvil's infringing coupling. All other competitors are respecting Victaulic's patents. Thus, Anvil's sales of its infringing SlideLok couplings take sales away from Victaulic's patented couplings.

Finally, while a lot of Courts jumped on the "stay" bandwagon when reexaminations were first permitted, some Courts have determined from their histories with reexaminations and stays that stays are inadvisable because reexaminations can go on for many years and often do not result in the simplification of cases.

II. SOME GOVERNING LEGAL PRINCIPLES

"A district court has broad discretion to grant or deny a stay pending [Patent and Trademark Office] reexamination of the patents-in-suit and 'is under no obligation to delay its own proceedings by yielding to ongoing [Patent and

Trademark Office] patent reexaminations, regardless of their relevancy to infringement claims which the court must analyze.'" *MercExchange, L.L.C. v. eBay, Inc.*, 500 F. Supp. 2d 556, 563 (E.D. Va. 2007) (quoting *NTP, Inc. v. Research in Motion, Ltd.*, 397 F. Supp. 2d 785, 787 (E.D. Va. 2005)).

There is no per se rule requiring that patent cases be stayed pending reexaminations because such a rule "would invite parties to unilaterally derail" litigation. *Soverain Software LLC v. Amazon.com, Inc.*, 356 F. Supp. 2d 660, 662 (E.D. Tex. 2005).

III. THE FACTORS COURTS USUALLY CONSIDER WHEN DECIDING WHETHER TO STAY A CASE

When resolving a motion to stay a case, Courts, including this Court, usually consider this three-part test:

1. whether a stay would unduly prejudice the non-moving party or provide a tactical advantage to the moving party;
2. whether a stay would simplify the issues in question and trial of the case; and
3. whether discovery is complete and whether a trial date has been set.

Cheng v. Sighting Sys. Instruments, LLC, No. 06-2326, 2007 WL 1341119, at *2 (N.D. Ga. May 3, 2007), citing *Xerox Corp. v. 3Com Corp.*, 69 F. Supp. 2d 404, 406-07 (W.D. N.Y. 1999).

In this case, as established below, the first factor strongly favors denial of the motion to stay. A stay would both (1) unduly prejudice Victaulic in the market and in this litigation and (2) provide an unfair tactical advantage to plaintiff Anvil by, in effect, possibly also staying Victaulic's properly brought infringement action in the Eastern District of Pennsylvania. As to the second factor, it is debatable and uncertain whether the stay would simplify issues in and the trial of this case. As to the third factor, discovery has not commenced because of the pending motion to dismiss for lack of subject matter jurisdiction or to transfer due to the convenience of the parties. Plaintiffs should not be rewarded, with regard to the third factor, by filing a case in a Court that does not have subject matter jurisdiction. Moreover, this Court has denied a stay even when a case is in an early stage if the first two factors "weigh strongly against a stay." *Cheng*, 2007 WL 1341119, at *3.

IV. THE MOTION TO STAY SHOULD BE DENIED

A. A Stay would be Unduly Prejudicial to Victaulic

1. Victaulic will be Prejudiced in the Market

A stay would result in the prolonged sale of the infringing SlideLok couplings by Anvil. Sales of the infringing SlideLok couplings, unabated for many years, would unduly inflict harm on Victaulic in the market in at least the following ways.

As background, the titles of the Victaulic patents-in-suit, U.S. Patent Nos. 7,086,131 (the "131 patent") and 7,712,796 (the "796 patent"), are the same - "Deformable Mechanical Pipe Coupling." Victaulic sells deformable mechanical pipe couplings covered by its 131 and 796 patents, which Victaulic calls its Installation Ready™ couplings. Exh. 1, ¶¶ 5 and 7.

A mechanical pipe coupling is a structural member that mechanically joins two pipes, usually end-to-end, and has at least one seal encompassing the pipe joint such that the fluid passing through the pipes and the joint does not leak from the coupling. *Id*. at ¶ 8.

Before the patented Installation Ready™ couplings were introduced in the market by Victaulic, mechanical pipe couplings had two substantially non-deformable ring segments that, when connected end-to-end, formed a ring. *Id* at ¶ 9. The pipe ends are received in that ring. *Id*. Those non-deformable pipe coupling segments are attached to each other on opposing sides by bolts. *Id*.

Those substantially non-deformable couplings include multiple components and were delivered to job sites partially or completely assembled. *Id*. at ¶ 10. To install those non-deformable couplings, the couplings generally had to be completely disassembled with the segments completely detached, the two pipe ends properly positioned end-to-end, the seal and the segments placed around the

two pipe ends in the desired location, and the bolts tightened. *Id*. That could be a tedious task for workers. *Id*. Those non-deformable mechanical pipe couplings and that procedure for installation have been the standard for decades. *Id*.

Victaulic's patented Installation Ready™ deformable couplings are a significant change from that standard. *Id*. at ¶ 11. The Installation Ready™ couplings have a center area defined by the interior surfaces of the ring segments that is large enough that, when the bolts are in place but in a prescribed sufficiently loose state, the seal and the couplings can fit over a pipe end without disassembling the couplings. *Id*. The other pipe end is then inserted into the coupling, and the bolts tightened. *Id*. The tightening of the bolts causes the segments to deform such that they conform to the outer surfaces of the pipe ends. *Id*.

To date, Victaulic's Installation Ready™ couplings have been designed and sold for four markets. *Id*. at ¶ 13. While Victaulic's Installation Ready™ couplings have gained a foothold in one of those markets, Victaulic is still seeking similar acceptance of its Installation Ready™ couplings in the other three markets. *Id*. Anvil's SlideLok coupling is for two of those three markets. *Id*.

While Victaulic's Installation Ready™ couplings are a major step forward in mechanical pipe coupling technology for all four of the couplings' current markets for various reasons, including ease of use and time savings during installation, the

two industries for which the SlideLok couplings are sold are historically slow to adopt new technologies. *Id*. at ¶ 14. Thus, it is very important that all deformable mechanical pipe couplings for those industries, regardless of the manufacturer or seller, not have any flaws and minimal failures, for the concept of deformable mechanical pipe couplings to gain acceptance in those industries. *Id*. at ¶ 15. If a deformable mechanical pipe coupling fails in those industries, there is a large risk that persons in those industries will deduce that the failure is a generic problem with all deformable mechanical pipe couplings, and not necessarily a problem limited to the particular coupling. *Id*. Thus, a less than effective deformable mechanical pipe coupling may contaminate the entire market for such couplings in those industries. *Id*.

Victaulic is concerned that the infringing SlideLok couplings will indeed contaminate the market in those two industries because of the couplings' drawbacks. Those drawbacks include that (1) the SlideLok coupling lacks any feature that positively locates the coupling relative to the pipe ends being joined, such that installation is challenging and the likelihood of mis-assembly is increased and (2) a very high torque is required which can discourage use and may mask installation errors. *Id*. at ¶ 16. Those drawbacks are significant because a mis-assembly can lead to a disaster, including personal injury. *Id*.

In addition, Victaulic's patented Installation Ready™ couplings and Anvil's infringing SlideLok couplings are the only two deformable mechanical pipe couplings on the market. *Id*. at ¶ 17. Thus, it is highly likely that any sales by Anvil of its SlideLok couplings would have been sales of Victaulic's Installation Ready™ coupling if the SlideLok couplings were not on the market. *Id*.; Exh. 8.

In contrast, in some of the cases cited by plaintiffs that find that the patent owner will not be unduly prejudiced by a stay, the Courts rely on the fact that the patent owner does not manufacture or sell patented products. *See, e.g.*, the case which is Exhibit C to plaintiffs' brief, *Microlinc, LLC v. Intel Corp.*, No. 07-488, 2010 U.S. Dist. LEXIS 99255, at *11-12 (E.D. Tex. Sept. 20, 2010) ("since Microlinc does not manufacture or sell any products, or otherwise practice the patent, there is no risk of customer losses or of injury to market share during a stay.") and *Roblor Mktg. Group, Inc. v. GPS Indus.*, 633 F. Supp. 2d 1341, 1347 (S.D. Fla. 2008). That is not true here - Victaulic is actively promoting, manufacturing, marketing and selling its Installation Ready™ deformable mechanical pipe couplings. Exh. 1, ¶ 12. Courts have denied stays when the parties are competitors. *See Cooper Notification, Inc. v. Twitter, Inc.*, No. 09-865, 2010 WL 5149351, at *5 (D. Del. Dec. 13, 2010) (denying motion to stay because parties are direct competitors); and *Interwoven, Inc. v. Vertical Computer Sys.*,

Inc., No. 10-04645, 2012 WL 761692, at *3 (N.D. Cal. Mar. 8, 2012). In another case cited by plaintiffs, *Southwire Co. v. Cerro Wire, Inc*., 750 F. Supp. 2d 775, 779 (E.D. Tex. 2010), the Court recognized that "the prejudice of staying [the patent owner's] claims against its direct competitors weighs heavily against a stay," but that the patent owner's amendments to the claims during the reexamination neutralized that prejudice. In this case, none of the 45 original claims of the 796 patent or the single original claim of the 131 patent have been amended during the reexaminations.

Finally, at page 18 of their brief, plaintiffs assert, "despite the passage of over two months since filing its corollary action in Pennsylvania, Victaulic has not filed any motion for preliminary injunction or temporary restraining order in that case, belying any cries of immediacy or irreparable harm." As the Court held in *Cooper*, 2010 WL 5149351, at *4, the fact that the patent owner did not file such a motion "tells one nothing … about the potential irreparability of any harm from any infringement (if ultimately proven)."

2. Victaulic will be Prejudiced in this Litigation

A stay, particularly of an indefinite length, may result in loss of evidence and the fading of witness memory. More than one Court has denied a stay for those reasons, even when other facts supported a stay. *See, e.g., Alltech, Inc. v.*

Cenzone Tech., Inc., No. 06-153, 2007 WL 9335516, at *2 (S.D. Cal. Mar. 21, 2007) ("when a party moves to stay litigation pending PTO reexamination, the non-moving party may be unduly prejudiced by the lapse of time during reexamination, which could result in loss of evidence and the fading of witness memory…the risk that witness memories could fade while waiting for reexamination is not insubstantial."); *Cooper*, 2010 WL 5149351, at *4 ("resuming this litigation after a protracted stay would likely raise issues with stale evidence, faded memories, and lost documents … [i]nfringement will also depend to some extent on how Defendants' accused products and services function today, which will be harder to prove years from now"); and *Interwoven*, 2012 WL 761692, at *3 ("Evidence, witness availability, and memory concerning the pertinent timeframe will likely become more stale and difficult to retrieve as time passes.") In this case, loss of evidence is a real possibility because, *inter alia*, two of the three Victaulic inventors have already retired, and a third is a senior engineer. Exh. 1, ¶ 6.

In addition, Victaulic has put a litigation hold on over thirty employees. *Id*. at ¶ 18. It would be very burdensome to maintain that hold on its document (paper and electronic) and emails for a number of years. *Id*.

B. Granting the Stay Will Result in an Unfair Tactical Advantage to Plaintiff Anvil - the Staying of Victaulic's Properly Brought Infringement Case Against Anvil

Plaintiffs filed this declaratory judgment complaint as a preemptive strike, before there was a case or controversy based on a real and immediate injury or threat of future injury caused by Victaulic. *See* Defendant's Motion to Dismiss or, in the Alternative, Transfer, and the corrected supporting memorandum and exhibits (Dkt. 6 and 7). If there was any doubt that the institution of this case was a preemptive strike, that doubt should be dissipated by this motion to stay.

Among the relevant facts are that Victaulic saw Anvil exhibiting its SlideLok coupling at a trade show in September, 2012. Exh. 3, ¶¶ 2-5. However, one cannot determine whether the SlideLok coupling or use of that coupling infringes any of the claims of the 796 and 131 patents by a visual inspection; rather, the coupling must be carefully measured and tested. Exh. 10, ¶ 12. Thus, after that trade show, Victaulic asked plaintiffs for three sample couplings to evaluate vis-à-vis the claims of Victaulic's patents. *See* Exh. 4. Instead of sending Victaulic the requested samples, plaintiffs raced to this Court and initiated this premature lawsuit. Plaintiffs then sent Victaulic three sample SlideLok couplings. *See* Exh. 5.

Victaulic carefully measured and tested a sample SlideLok coupling and determined that it infringes Victaulic's patents-in-suit when used in accordance with Anvil's installation instructions. Exh. 10, ¶ 16. Based on, and only after, those measurements and tests, Victaulic filed an affirmative infringement case in the Eastern District of Pennsylvania, where the infringing SlideLok couplings are made and distributed. *See* Exhs. 6 and 7.

If this case is stayed, and the Eastern District of Pennsylvania Court strictly follows the first filed rule, plaintiff Anvil will have achieved the unfair tactical advantage of preempting the properly brought infringement case with this case in which subject matter jurisdiction is lacking.

C. The Reexaminations are Far From Over

While plaintiffs focus on the fact that the reexaminations are underway, asserting that the reexaminations are "already long in question" (plaintiffs' brief, page 2), they gloss over the fact that the reexaminations are far from being completed. Further, the time period from now until all the reexaminations are completed (the requested length of the stay) is unknown and indefinite. The reexaminations face the following prolonged path to completion.

First, all the reexaminations are still before the reexamination unit. When the reexamination unit finally completes its portion of the reexamination

proceedings, those determinations will be appealed to the Patent Trial and Appeal Board ("Board").[1] The Board has a large backlog, with a delay of almost three years. With regard to the *inter partes* reexaminations, any unhappy party (and there is guaranteed to be an unhappy party) can then appeal to the Federal Circuit, which adds another one or two years in delays.

Second, any of the reexaminations can be remanded at any stage for further review by the reexamination unit. That can occur in the decisions of both the Appeal Board or the Federal Circuit, and a remand essentially restarts the cycle. 37 C.F.R. § 41.77(a).

The present reexaminations themselves evidence the indefinite nature of the requested stay. With regard to Anvil's reexamination no. 95/001,880, the Patent Office issued an Action Closing Prosecution (discussed at page 4 of plaintiffs' brief) on July 13, 2012. The Patent Office has yet to issue a right of appeal notice (also discussed at page 4 of plaintiffs' brief), even though over six months have passed. In that same reexamination, Anvil filed a second petition on August 15, 2012, requesting that the Patent Office reconsider the finding that Anvil's request

[1] The name of the appellate board within the Patent Office. That board was previously known as the Patent Office Board of Patent Appeals and Interferences. Its name was changed by the America Invents Act. 35 U.S.C. § 6 (as amended by Public Law 112-29 (September 16, 2011)).

for reexamination did not raise a new issue of patentability with regard to claims 3, 13, 17, 23, 29, 35-37, 39-40 and 42 of the 796 patent. That petition is still pending, over five months later.

In addition, with respect to Anvil's reexamination no. 95/001,878, Anvil filed comments after a non-final action on August 17, 2012. The ball is in the Patent Office's court, but the Patent Office has not acted for over five months.

The lack of predictability of the duration of reexaminations can be determined from at least one of the cases in this Court relied on by plaintiffs. In the *IP Co., LLC v. Tropos Networks, Inc.*, Case No. 1:06-cv-00585 (N.D. Ga. filed Mar. 13, 2006), this Court granted a motion to stay due to a pending reexamination of the patent-in-suit, based on the assumption that the reexamination would be completed in eight to ten months, because the reexamination was supposedly already at a later stage. Exhibit A to plaintiff's brief, at page 5. However, in fact, the reexamination did not end until years later and the stay of the case lasted from August 16, 2007 to September 8, 2011, over four years. That case is still in its initial stages, despite the fact that the complaint was filed on March 13, 2006, and the issues have not been simplified.

In another patent case in this Court in which the case was stayed because of a reexamination, in fact, because of three *inter partes* reexaminations of the three

patents-in-suit, *Graywire, LLC v. Ciena Corp*., Case No. 08-2993 (N.D. Ga. filed Sept. 24, 2008), the case was stayed (terminated) on July 17, 2009. The case is still terminated, three and one-half years later, and a review of the Patent Office records regarding the three reexaminations uncovers that they are far from over. One is still on appeal to the Board and, in the other two, post-Board appeals briefing was permitted and is ongoing.

Those cases establish that reexaminations take a long time - many years. *See also Life Techs. Corp. v. Illumina, Inc*., No. 09-706, 2010 WL 2348737, at *2 (D. Del. Jun. 7, 2010) ("reexaminations … are likely to take 6.5 to 8 years to reach a final decision.") and *In re Am. Acad. of Sci. Tech. Ctr*., 367 F.3d 1359 (Fed. Cir. 2004) (affirming the Board's decision approximately ten years after reexamination was first requested.).

D. The Reexaminations May Not Simplify or Reduce Issues

On page 16 of their brief, plaintiffs assert that a stay "will save substantial expense by simplifying and focusing the issues before this Court," citing that Victaulic has added eight new claims to the 131 patent during the reexaminations. However, what plaintiffs neglect to tell this Court is that all of those eight new claims are method claims and that all the limitations of those eight claims are either in original method claim 1 of the 131 patent or the original apparatus claims

of the 796 patent. That is, Victaulic took claim limitations from the original apparatus claims of the 796 patent and included them in the new method claims of the 131 patent. There are no new limitations in the new claims of the 131 patent. The same terms and phrases in claims of related patents are presumed to have the same meaning. *Omega Eng'g, Inc. v. Raytek Corp*., 334 F.3d 1314, 1334 (Fed. Cir. 2003). Thus, the new 131 patent claims neither simplify nor complicate this case. "Indeed, if the claims at issue in this litigation are similar to the ones sought to be added, as the Plaintiffs claim, conclusion of this litigation may allow the parties to avoid litigation over any new claims allowed by the USPTO." *Cheng*, 2007 WL 1341119, at *2 n.3.

Moreover, while it is true that other new claims may be added or the claims amended during the pending reexaminations, this Court has held that at least the addition of claims may not simplify or reduce issues before the Court. *Cheng*, 2007 WL 1341119, at *2. Another Court has held that even though the outcome of reexaminations could be helpful in infringement litigation, the possible impact of a reexamination on infringement litigation is "only speculation" until the reexamination is completed. *Alltech*, 2007 WL 935516, at *3. *See also Interwoven*, 2012 WL 761692, at *3 (citing that all claims are cancelled in only 12% of reexaminations according to Patent Office data) and *Comcast Cable*

Commc'ns, 2007 WL 1052883, at *1 (N.D. Cal. April 5, 2007) (finding it unlikely that amendments to claims during a reexamination will "make an important difference" and even less likely that claims will be cancelled.)

Further, if the original claims are amended, or if the orginal claims are cancelled but new claims added, the doctrine of intervening rights under 35 U.S.C. § 252 will have to be adjudicated if the case is stayed until the reexamination proceedings are completed. *See* 35 U.S.C. §§ 307(b) and 316(b) and *Laitram Corp. v. NEC Corp*., 163 F.3d 1342 (Fed. Cir. 1998). More specifically, when claims are amended and/or added during a reexamination proceeding, an alleged infringer may have rights vis-à-vis those claims in comparison with the original claims. Those rights are called "intervening rights," and are defined by 35 U.S.C. § 252. The interpretation of § 252 is complex and fact intensive. Specifically, § 252 includes two paragraphs. The first paragraph provides, *inter alia*, that the reexamined patent has effect continuously from the day of its original patent only to the extent that the claims of the reexamined patent are substantially identical to the claims of the original patent. The second paragraph provides, *inter alia*, that a person has the right after the date of the reexamination certificate "to sell to others to be used, offered for sale or sold" any specific thing that was in existence in the

United States before the date of the reexamination certificate, unless the post-reissue sale "infringes a valid claim … which was in the original patent."

Accordingly, the stay may not benefit the Court because it may actually result in complication of the issues.

Finally, while plaintiffs assert that not staying the case may result in two cases - one on the original claims and one on the reexamined claims, this Court has held that the potential for a second suit when claims are being reconsidered by the Patent Office "does not eliminate the very real prejudice" to the non-movant. *Cheng*, 2007 WL 1341119, at *2.

E. Many of the Alleged Advantages on Pages 11 and 12 of Plaintiffs' Supporting Brief are Illusory

Plaintiffs present a list of bullet points bridging pages 11 and 12 of their supporting brief that are alleged advantages of staying cases. Many of those advantages are illusory or very hypothetical when applied to this case. Examples are discussed below.

First, "[a]ll prior art presented to the Court will have been first considered by the PTO, with its particular expertise." That is illusory because, even though the prior art presented in the Tyco reexaminations will have been considered by the PTO, that will not be of any benefit in this case if plaintiffs assert the same prior art. Experts will still have to address the prior art and the prior art will be

presented to the jury in the same manner as if there had been no Tyco reexaminations.

Second, "[t]he record of reexamination would likely be entered at trial, thereby reducing the complexity and length of the litigation." In fact, the "record of the reexaminations" will complicate the litigation because the record will include additional materials to consider when construing the claims and in resolving the intervening rights defenses discussed above.

Third, "[t]he cost will likely be reduced for the parties and the Court." There is no actual data to support that assertion. In fact, all discovery and pretrial procedures will remain the same, and may be more complicated by new issues due to the reexaminations, such as any asserted intervening rights defense.

F. Infringement Litigation and Reexamination Proceedings May Proceed Concurrently

The Federal Circuit has held that, due to the differences in infringement litigation and reexaminations, those proceedings may proceed concurrently. *Ethicon, Inc. v. Quigg*, 849 F.2d 1422, 1427 (Fed. Cir. 1988).

V. EXPERIENCED COURTS HAVE DETERMINED THAT STAYS DO NOT ACHIEVE THEIR HOPED-FOR GOAL

One Court very experienced in patent matters and stays in view of reexaminations held that such stays may not be advisable based on its history with such stays:

> … there appears to be a growing concern among at least some judges in this district that, on balance, staying a case even in its early stages pending reexamination has not led to the just, speedy and efficient management of the litigation, but instead has tended to prolong it without achieving sufficient benefits in simplification to justify the delay. This concern stems in part from the unpredictable but often lengthy duration of the stay due to the length of the PTO reexamination proceedings … in contrast to the statutory effect of firm deadlines on efficient case management.

Network Appliance, Inc. v. Sun Microsystems, Inc., No. C-07-06053, 2008 WL 2168917, at *3 (N.D. Cal. May 23, 2008).

In *Comcast Cable Commc'ns*, 2007 WL 1052883, at *1, the Court denied an agreed to request for a stay because of the effect of stays on Court calendars:

> If litigation were stayed every time a claim in suit undergoes reexamination, federal infringement actions would be dogged by fits and starts. Federal Court calendars should not be hijacked in this manner.

VI. IF THE COURT DECIDES A STAY IS WARRANTED, THE COURT SHOULD TERMINATE THE CASE AS IT HAS DONE PREVIOUSLY

In previous cases in which this Court has granted a motion to stay a patent case in view of a reexamination proceeding, this Court has terminated the cases

subject to re-filing. *See* Exhibits B and D to plaintiffs' brief and *Tomco*^{2} *Equip. Co. v. Southeastern Agri-Systems, Inc*., 542 F. Supp. 2d 1303, 1312 (N.D. Ga. 2008). At the least, Victaulic requests that the remedy, if this Court decides to grant the motion, is termination of the case. That will enable the United Stated District Court for the Eastern District of Pennsylvania to proceed with its case if it so desires.

VII. CONCLUSION

For the above reasons, Victaulic respectfully submits that the Court should deny the motion to stay. In the alternative, this case should be terminated as discussed in Section VI above.

Dated: January 22, 2013

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LOCAL RULE 5.1C CERTIFICATION

By signature below, counsel certifies that the foregoing pleading was prepared in Times New Roman, 14-point font, in compliance with Local Rule 5.1C.

This 22nd day of January, 2013.

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IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF GEORGIA
ATLANTA DIVISION

MUELLER WATER PRODUCTS, INC., and ANVIL INTERNATIONAL, LLC,	)	
Plaintiffs,	)	
v.	)	Civil Action No. 1:12-cv-03446-JEC
VICTAULIC COMPANY,	)	
Defendant.	)	

CERTIFICATE OF SERVICE

This is to certify that the foregoing **Defendant's Memorandum in Opposition to Plaintiffs Mueller Water Products, Inc. and Anvil International, LLC's Motion for a Stay Pending Reexamination of the Patents-in-Suit** was filed today with the Clerk of Court using the CM-ECF System which automatically sent an e-mail notification of such filing to the following attorney(s) of record:

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Exhibit 1

Under Seal

EXHIBIT 2

US007086131B2

(12) **United States Patent**
Gibb et al.

(10) **Patent No.: US 7,086,131 B2**
(45) **Date of Patent: Aug. 8, 2006**

(54) **DEFORMABLE MECHANICAL PIPE COUPLING**

(75) Inventors: **John Gibb**, Beeton (CA); **Douglas R. Dole**, Whitehouse Station, NJ (US); **Michael S. Pigott**, Bluffton, SC (US)

(73) Assignee: **Victaulic Company**, Easton, PA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **11/124,781**

(22) Filed: **May 9, 2005**

(65) **Prior Publication Data**

US 2005/0253380 A1 Nov. 17, 2005

Related U.S. Application Data

(60) Provisional application No. 60/571,596, filed on May 14, 2004.

(51) **Int. Cl.**
B21D 39/04 (2006.01)

(52) **U.S. Cl.** **29/282**

(58) **Field of Classification Search** 285/110, 285/111, 112, 364, 420, 411; 29/282
See application file for complete search history.

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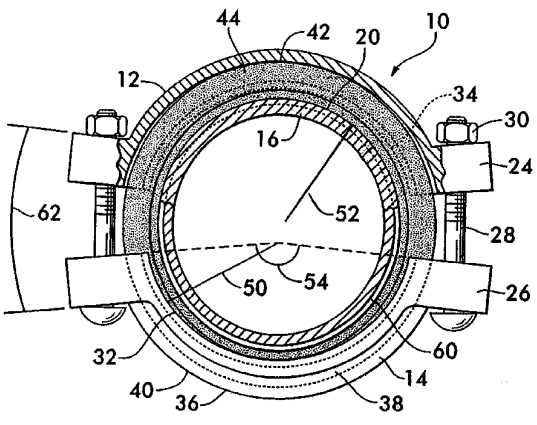
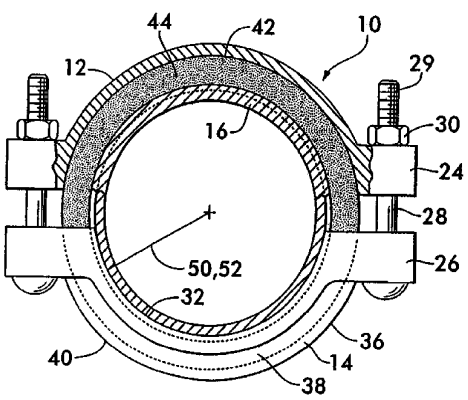
(57) **ABSTRACT**

A deformable mechanical pipe coupling is disclosed. The coupling has a plurality of interconnectable segments that straddle the ends of pipe elements to be joined. The segments have arcuate surfaces that engage outer surfaces of the pipe elements. The outer surfaces subtend an angle of less than 180° and have radii of curvature greater than the radii of curvature of the pipe element outer surfaces. The segments have adjustably tightenable connection members for connecting the segments to one another. When the connection members are tightened, the arcuate surfaces deform and conform to the radius of curvature of the outer surface of the pipe elements.

1 Claim, 14 Drawing Sheets





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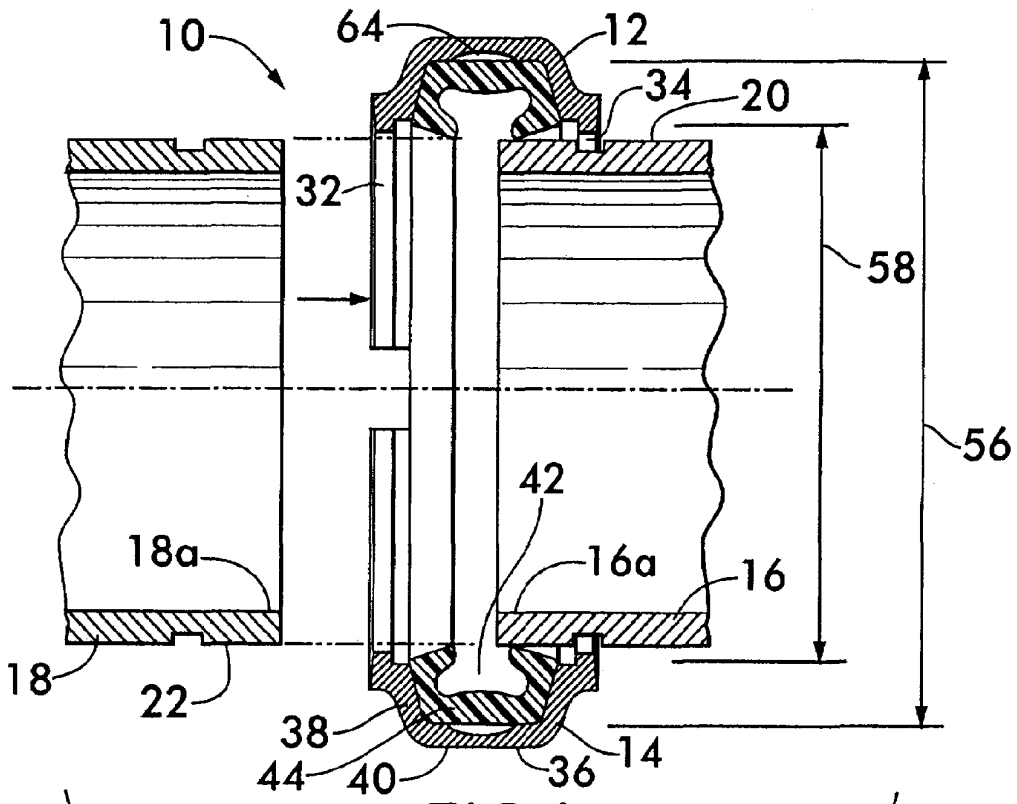
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FIG.1

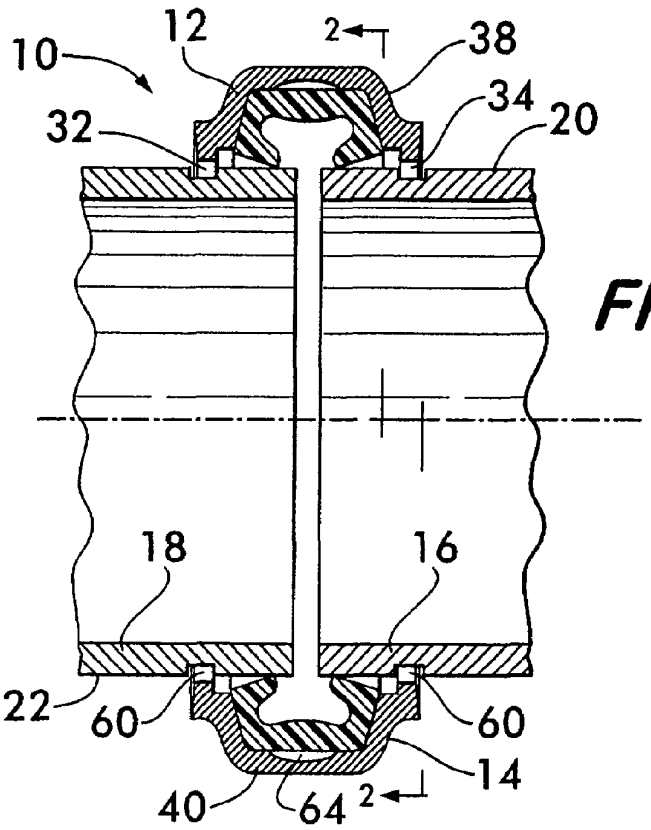
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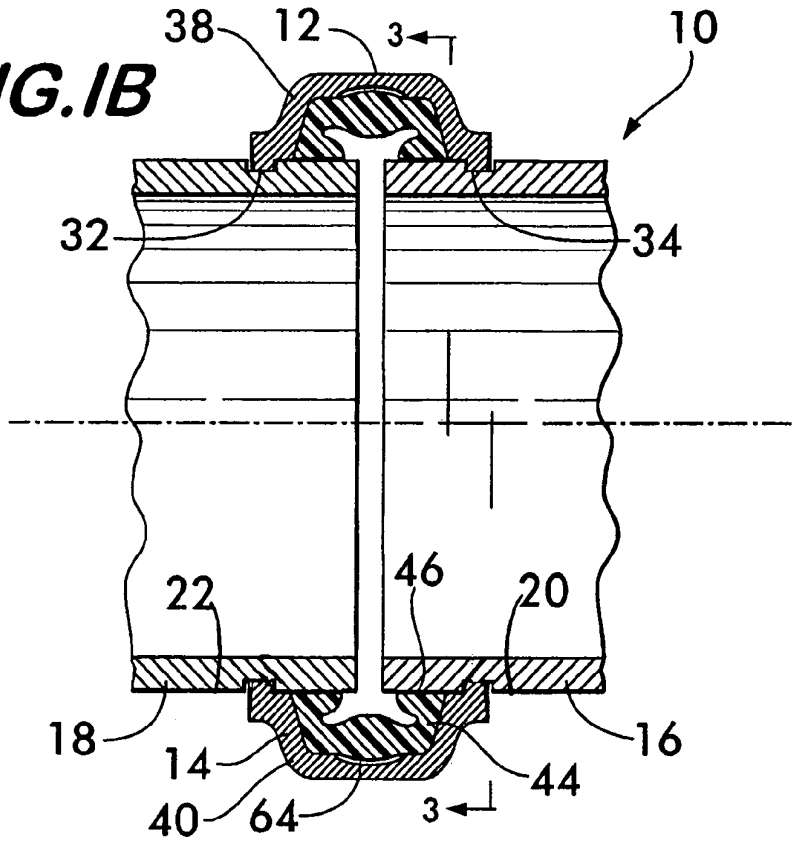
FIG.1A

FIG.1B



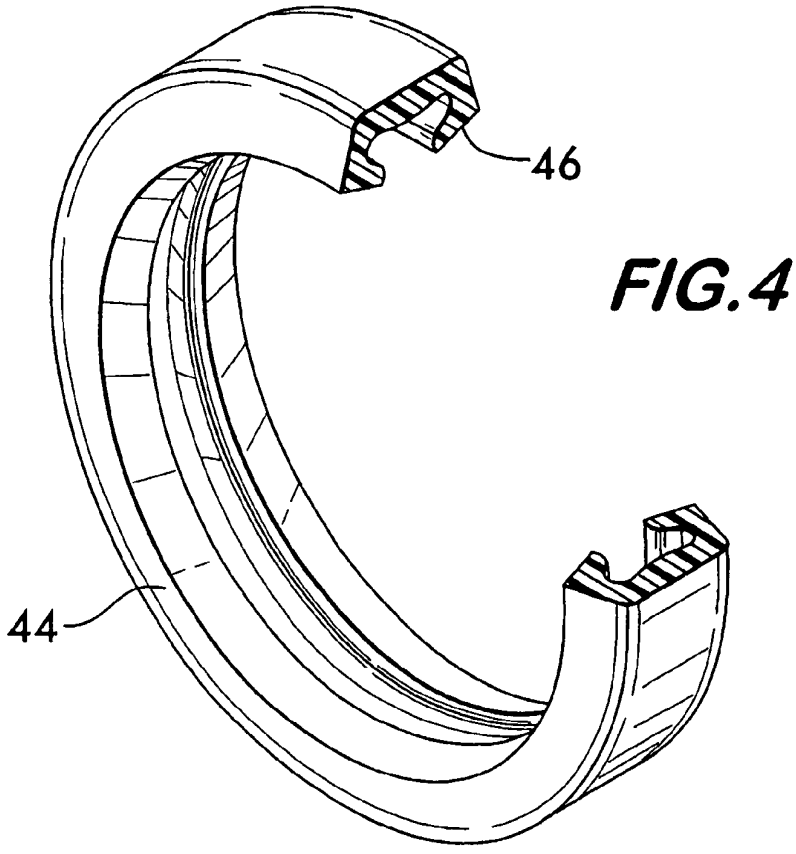
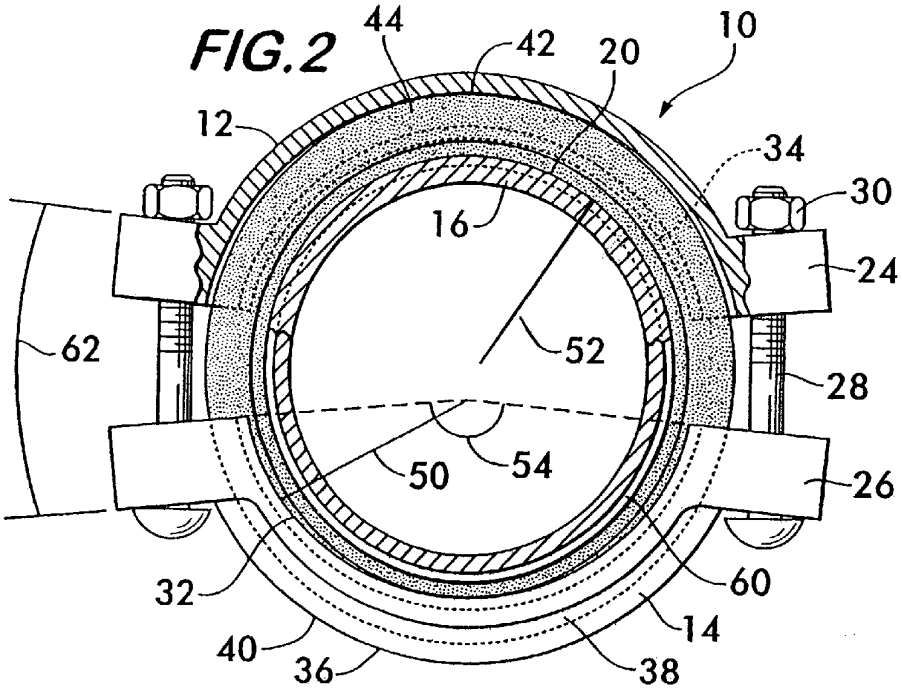


FIG.4

FIG.2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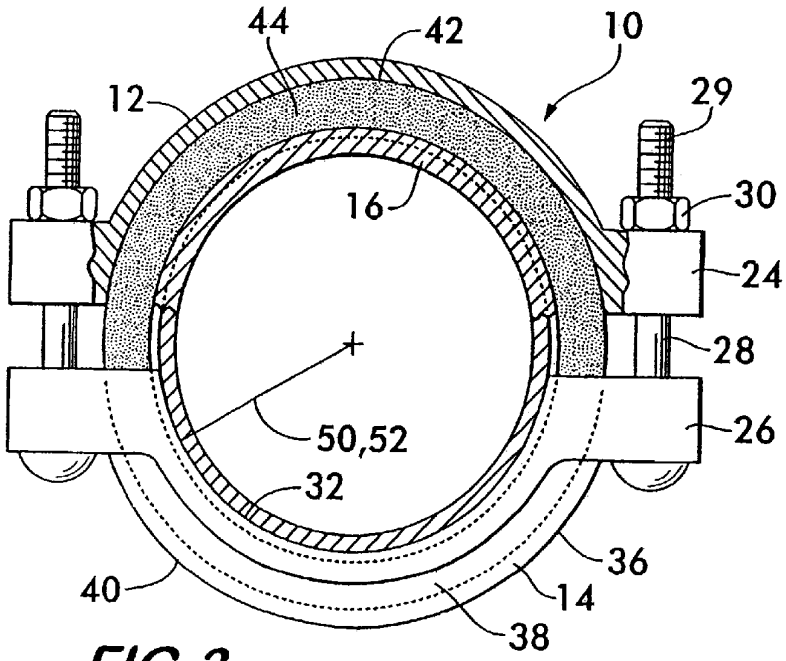
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FIG.3

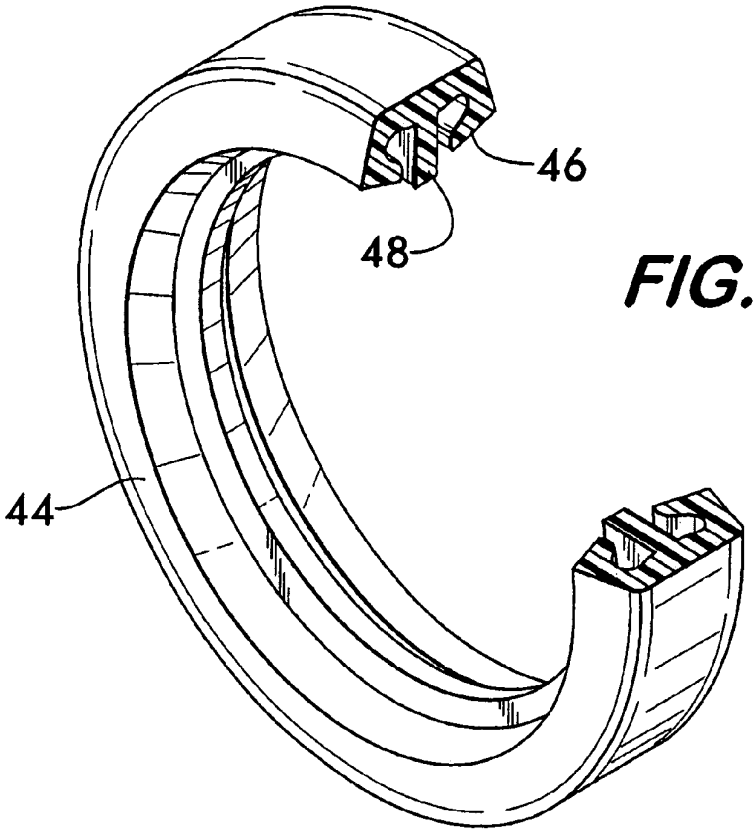


FIG.5

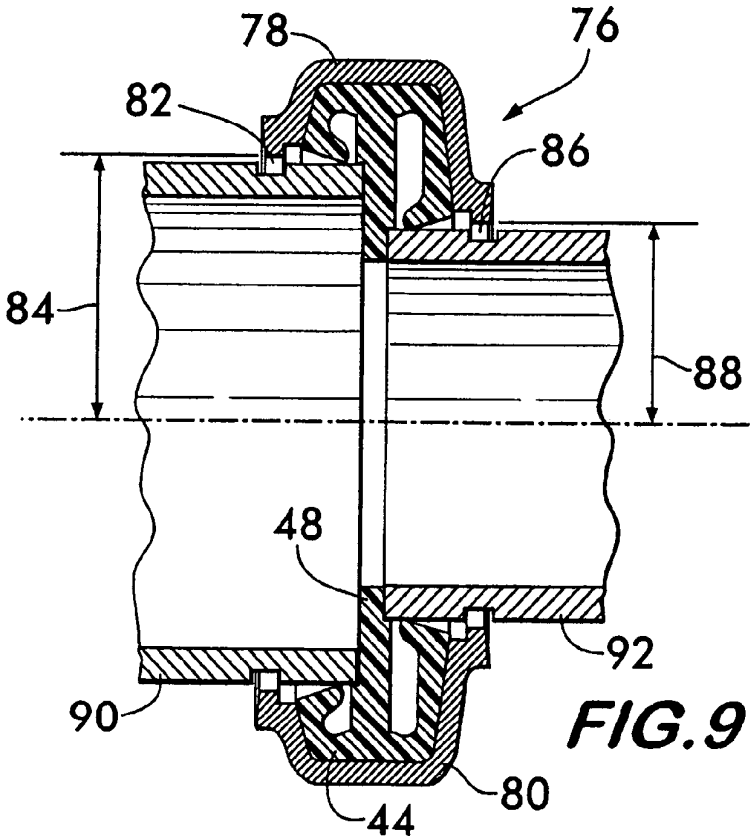
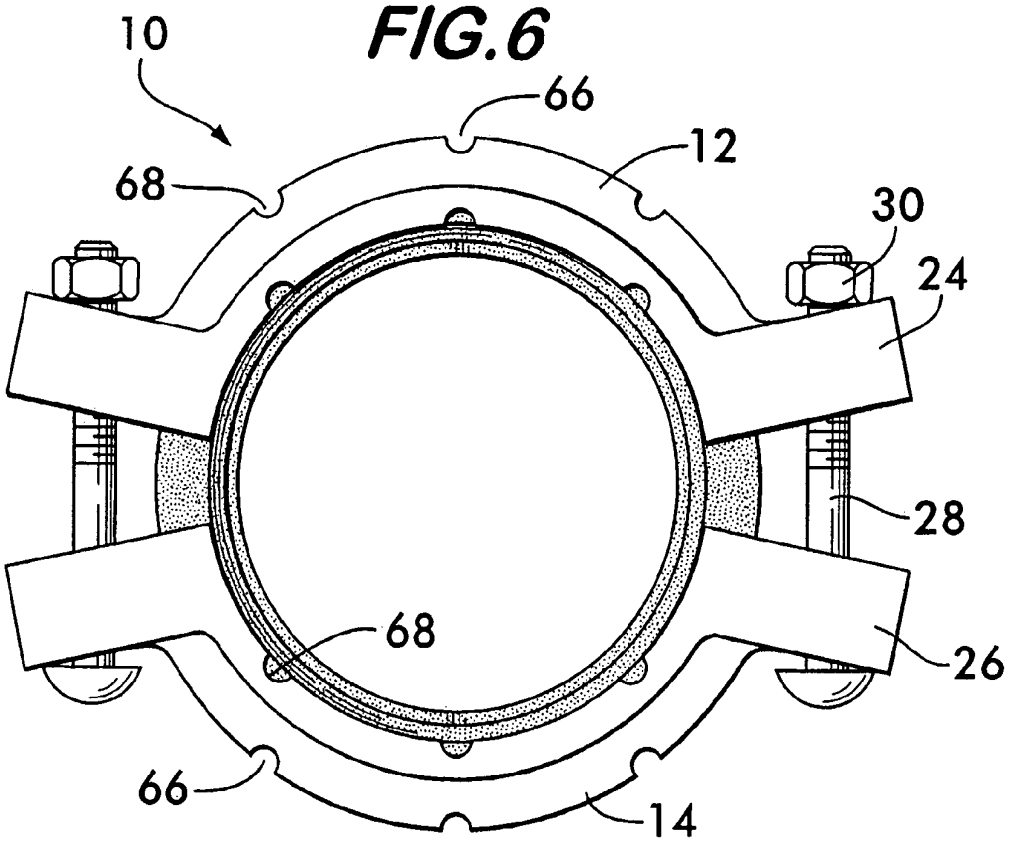


FIG.9

FIG.6



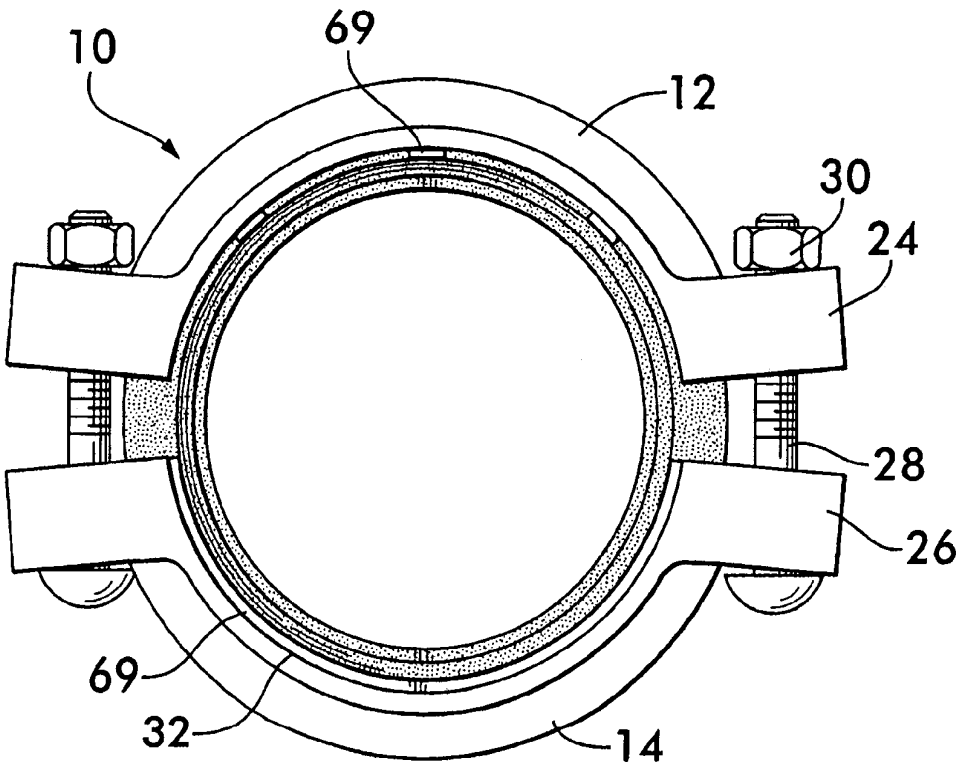
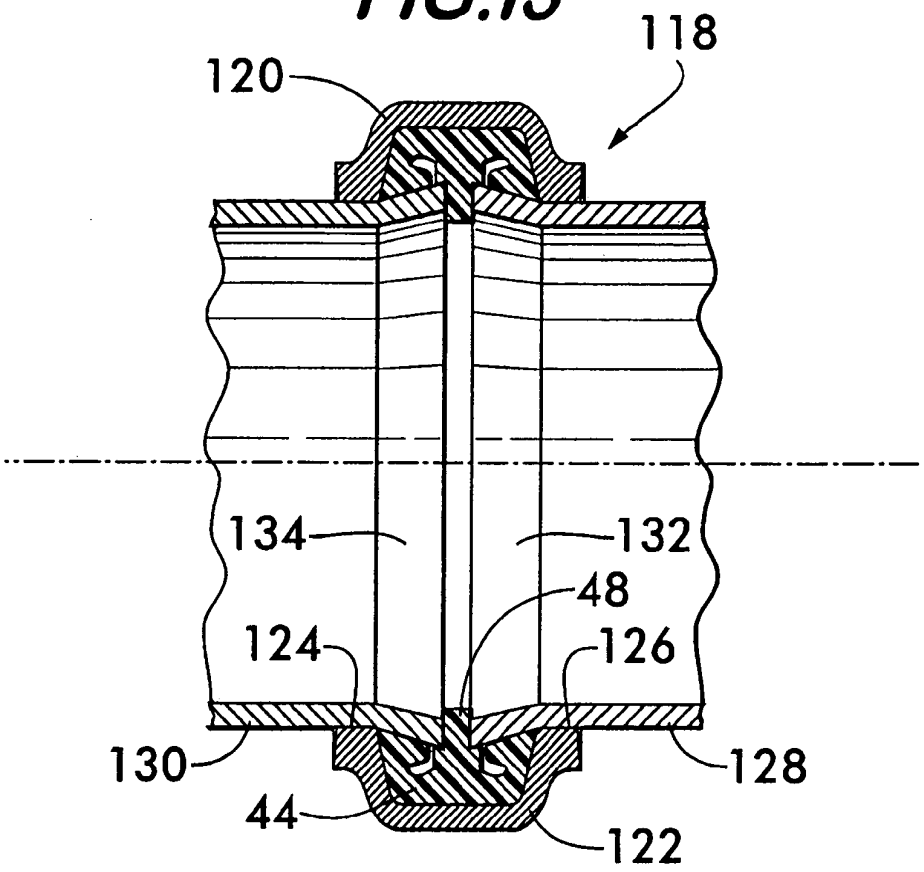


FIG.7

FIG. 13



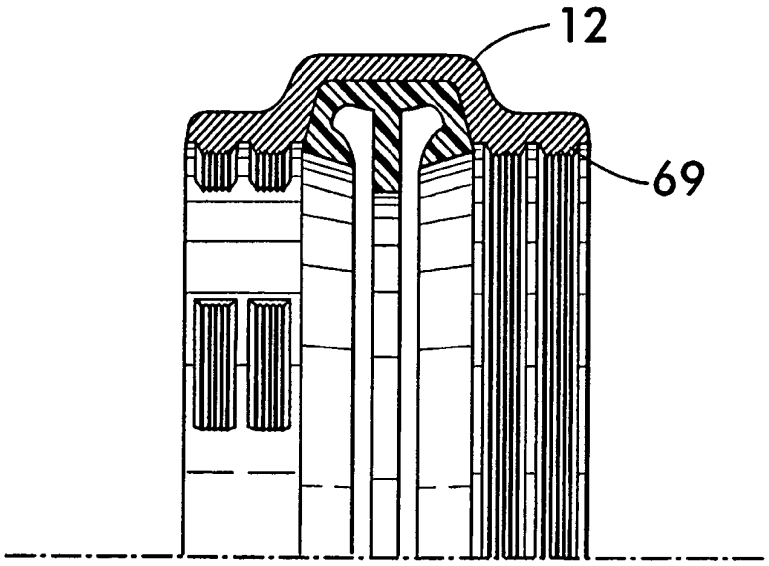
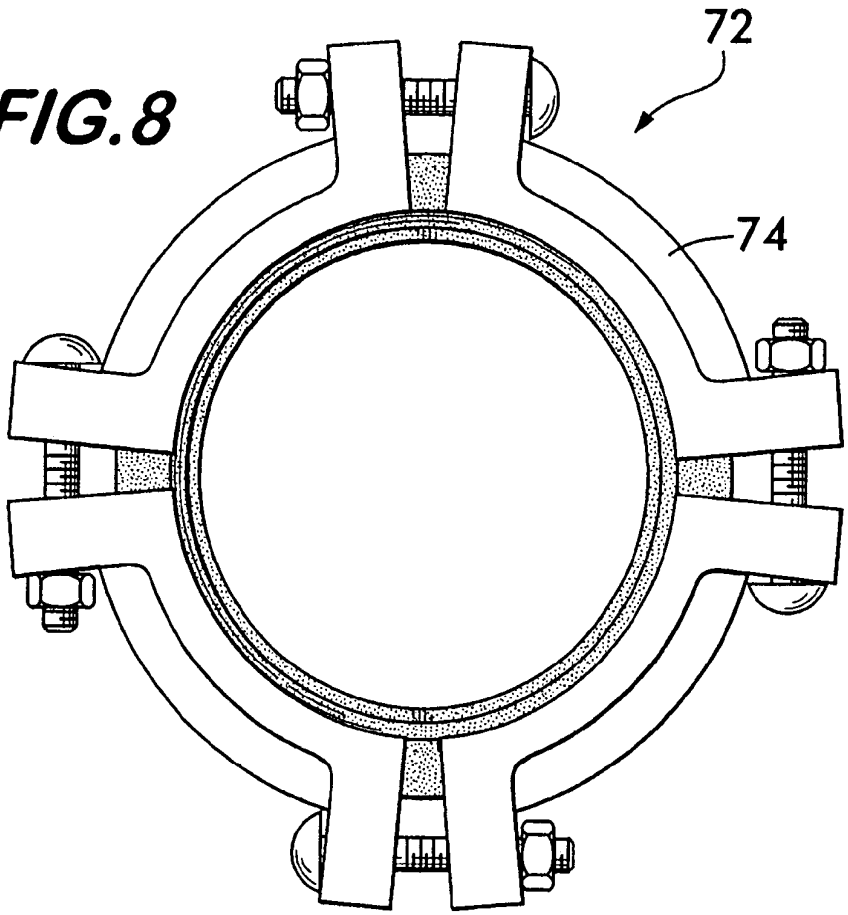


FIG. 7A

FIG.8



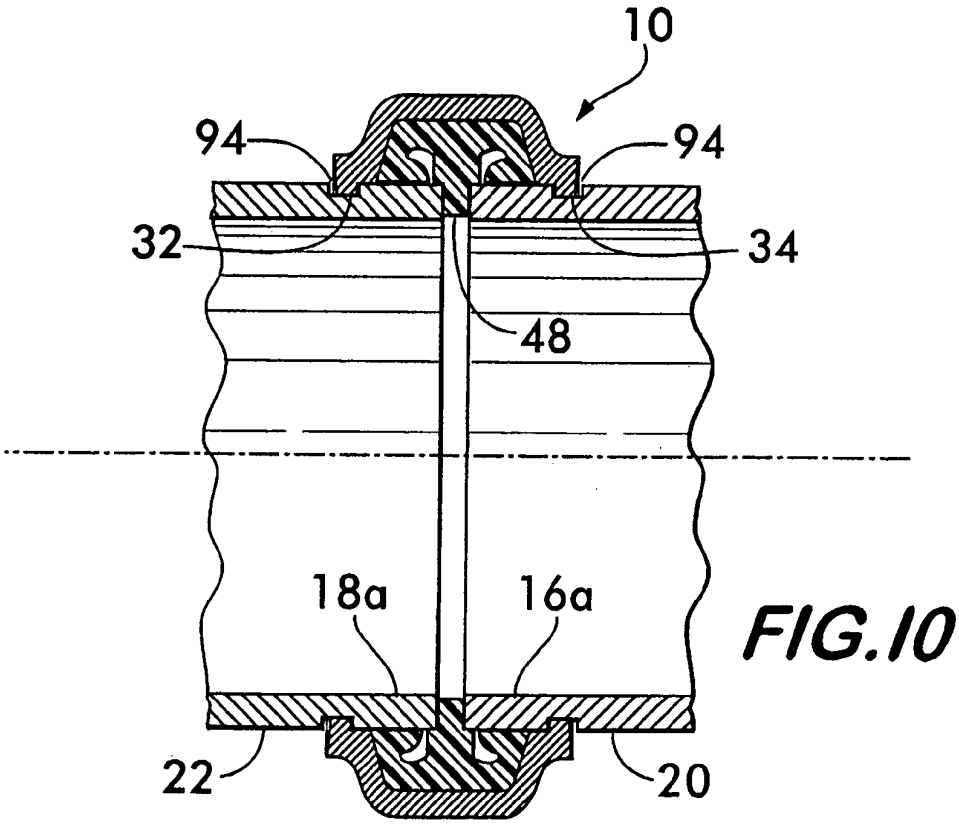
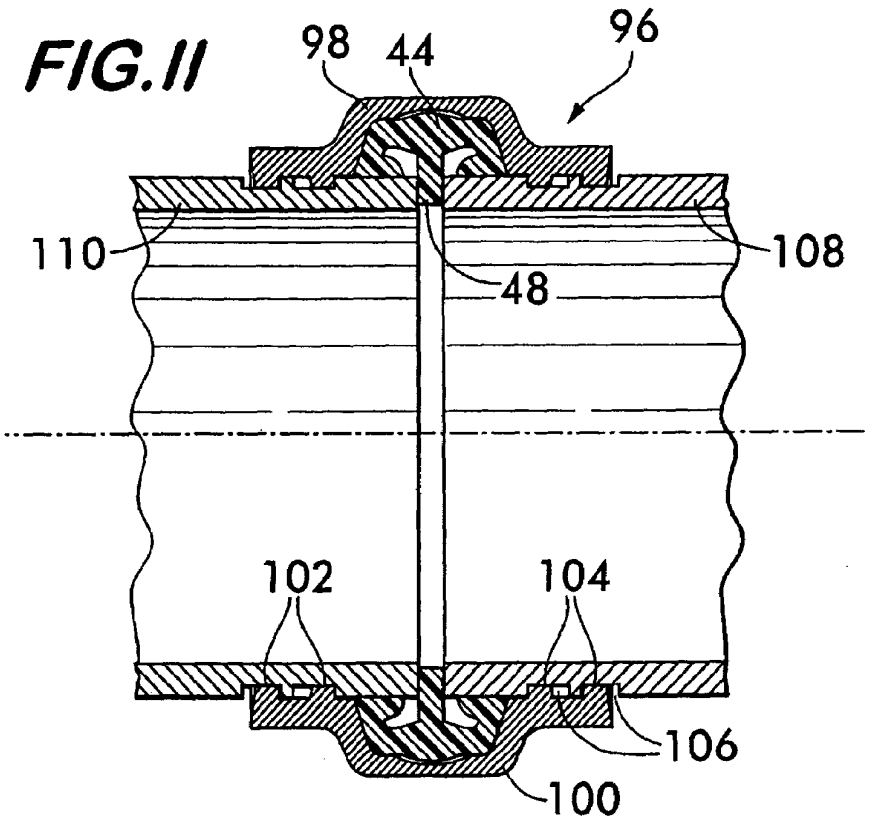


FIG.10

FIG. 11



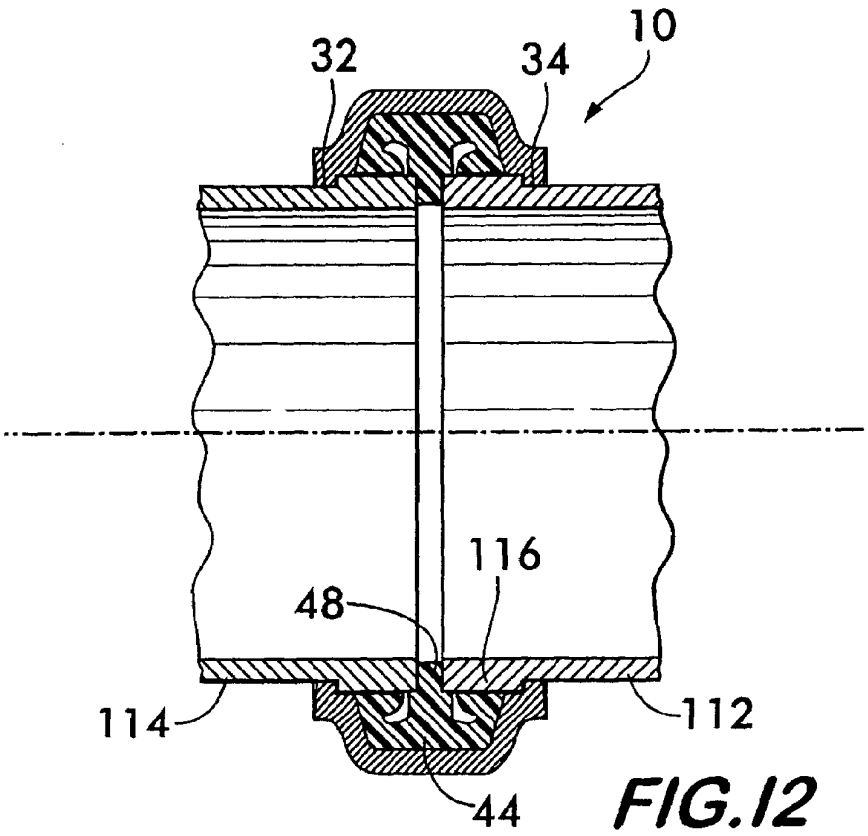
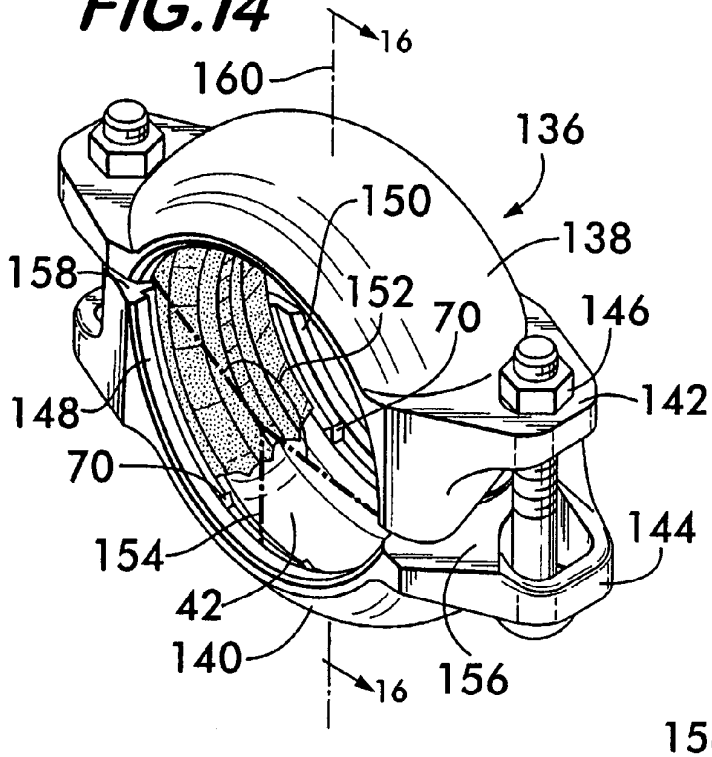
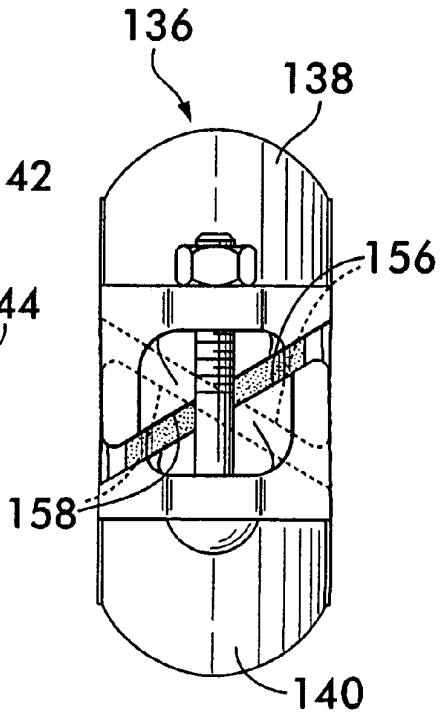


FIG. 12

FIG.14





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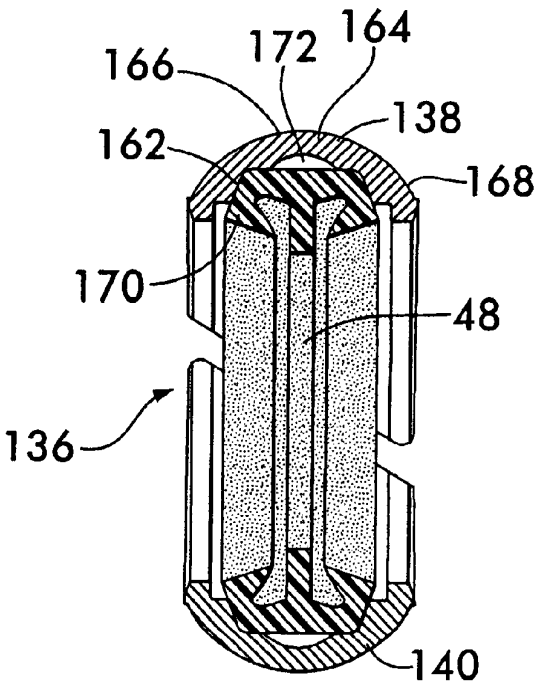
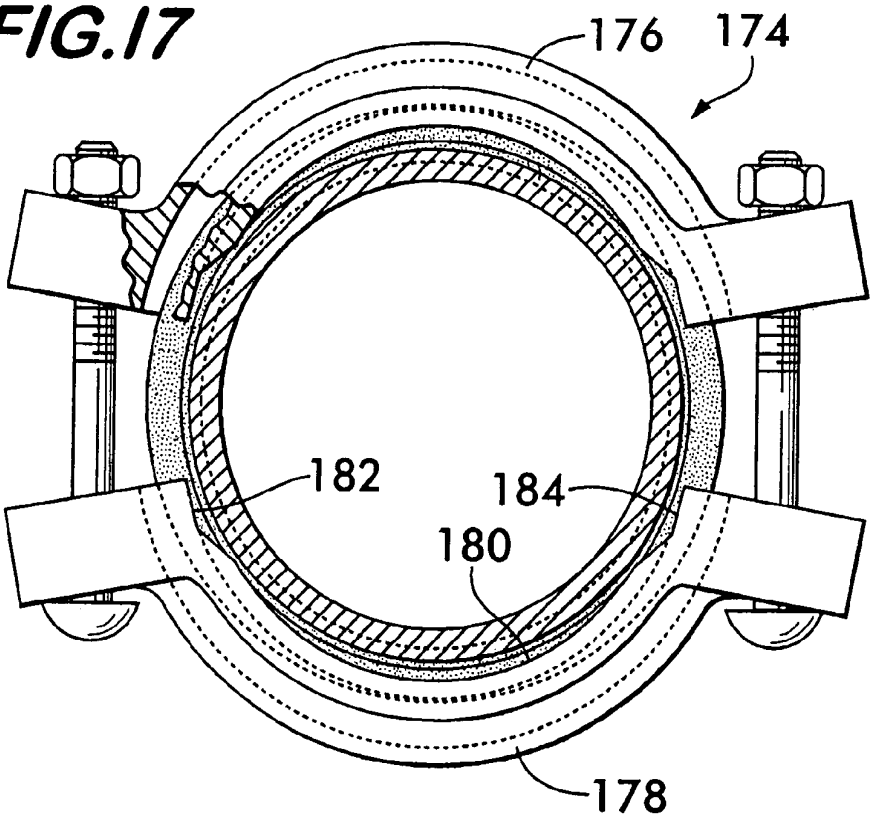


FIG.16

FIG.17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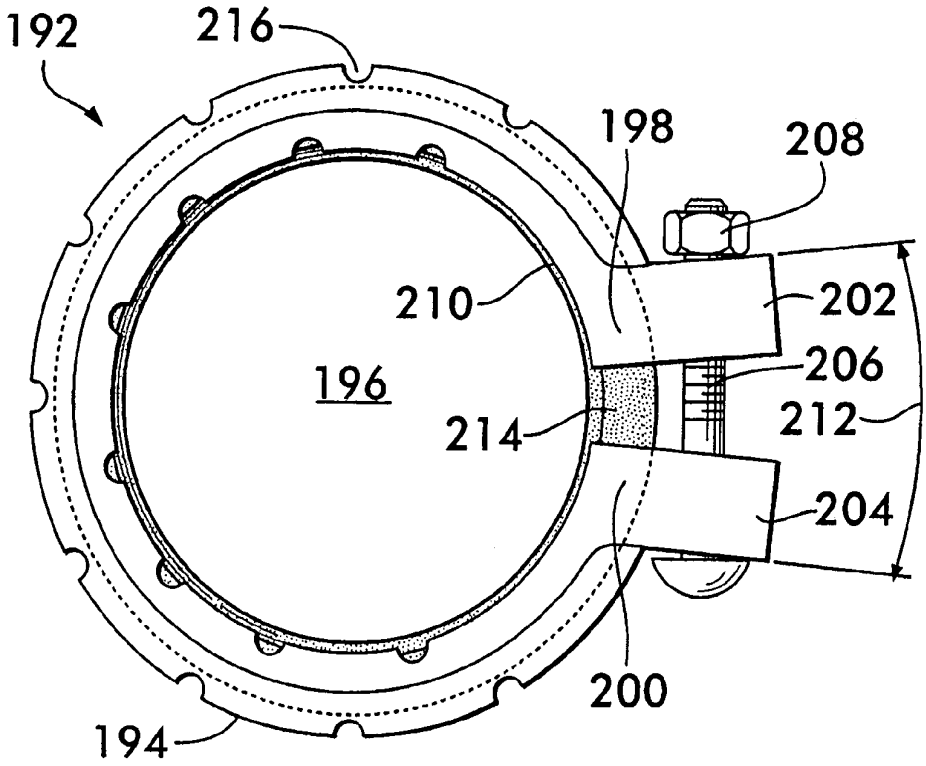
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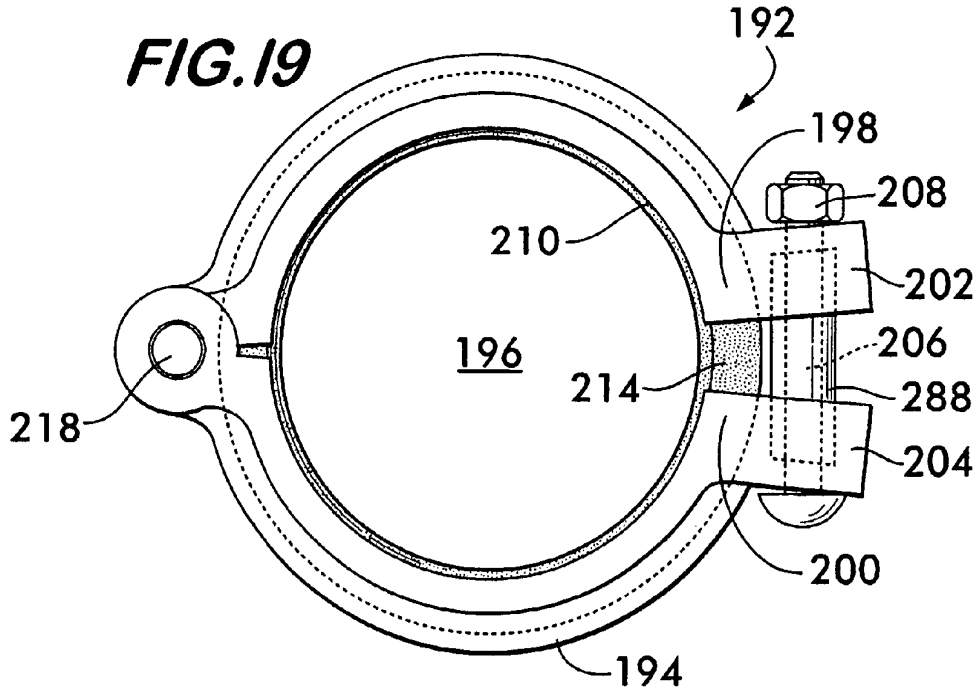
FIG.18

FIG. 19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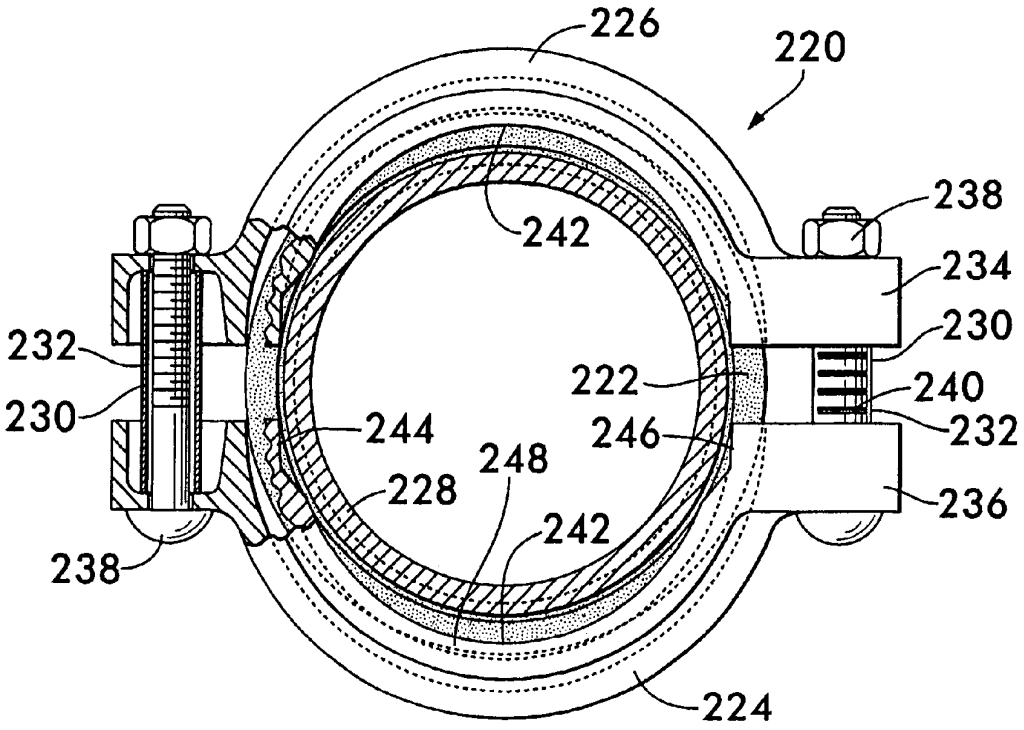

226
220
242
238
234
232
230
222
240
230
244
246
232
248
228
236
242
238
224

FIG. 20

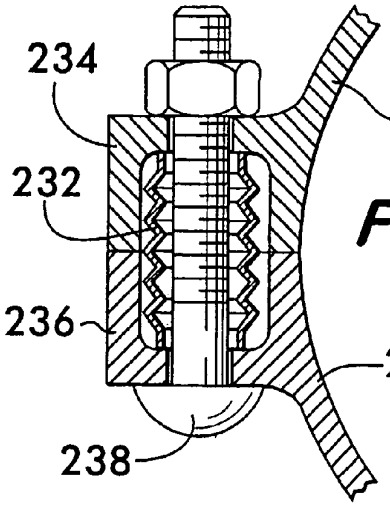


FIG. 21

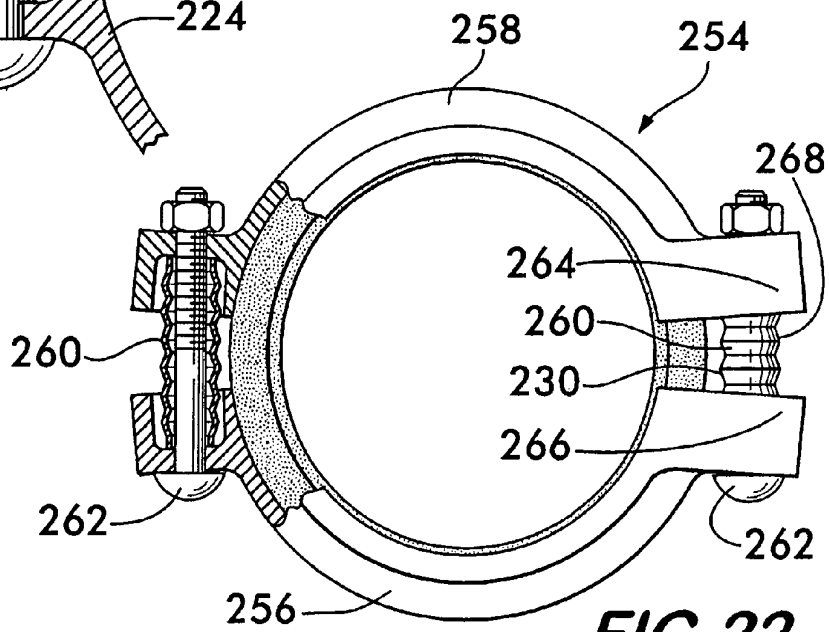


FIG. 22

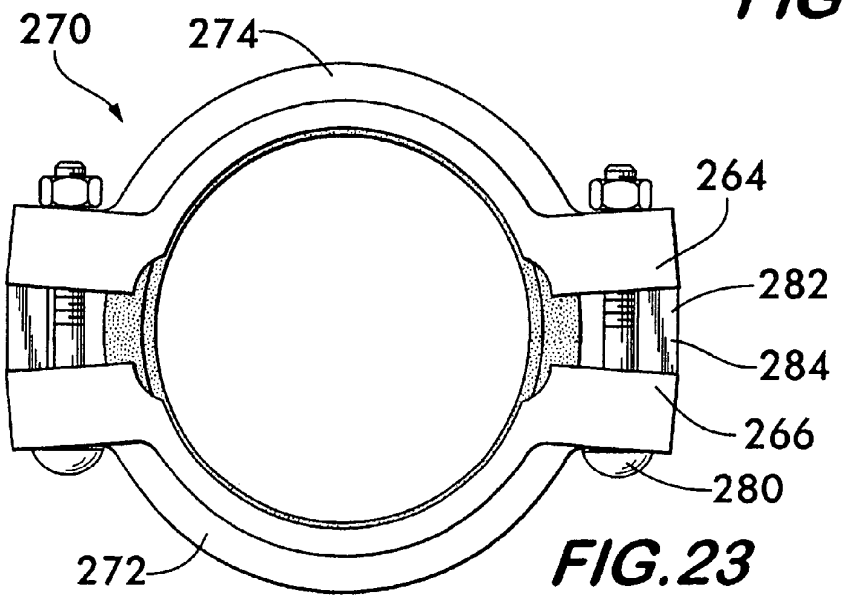
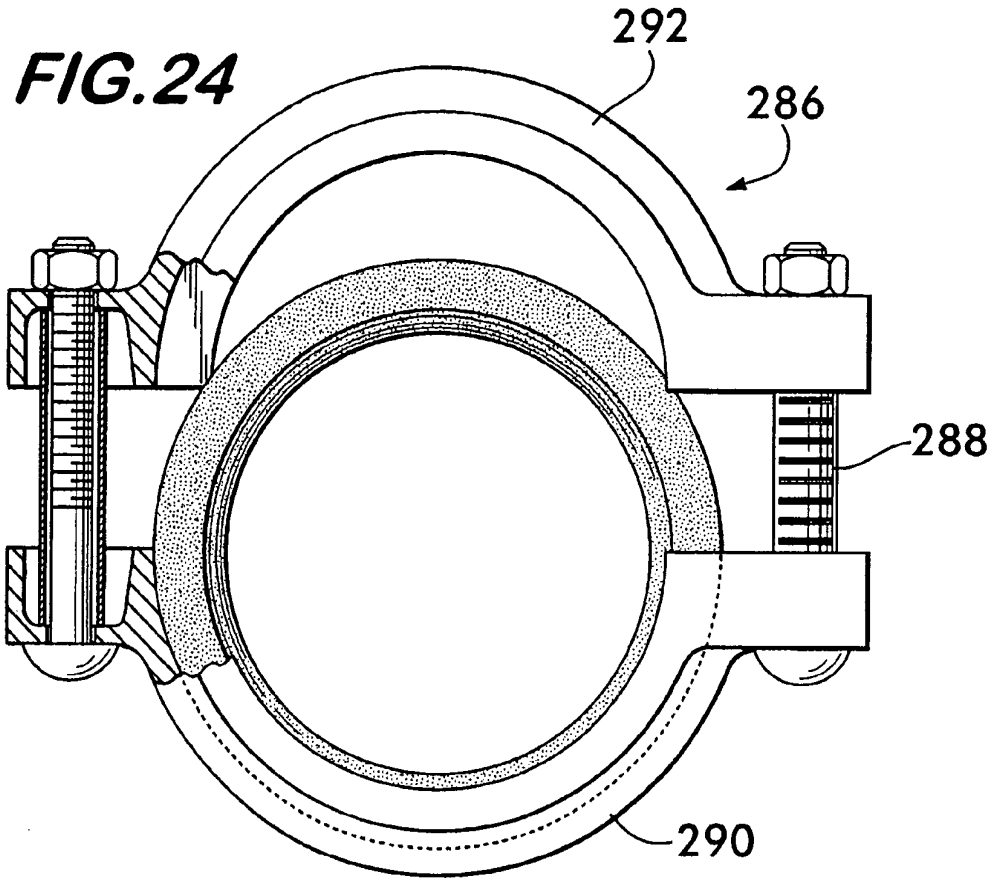


FIG. 23

FIG.24



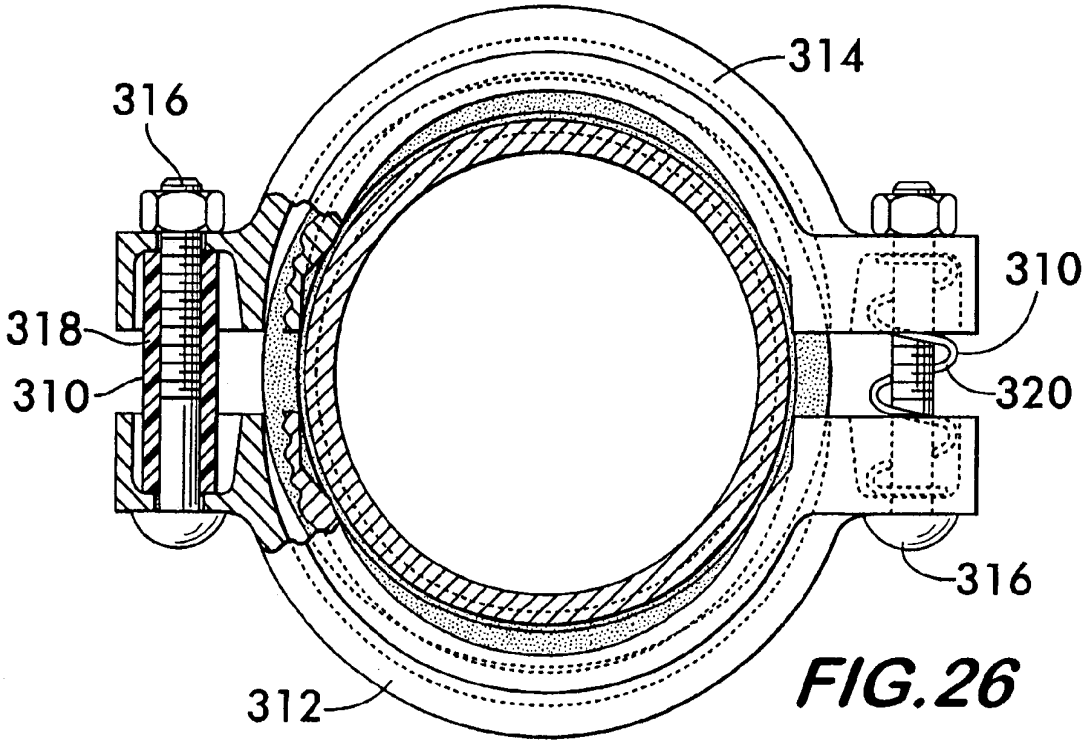


FIG.26

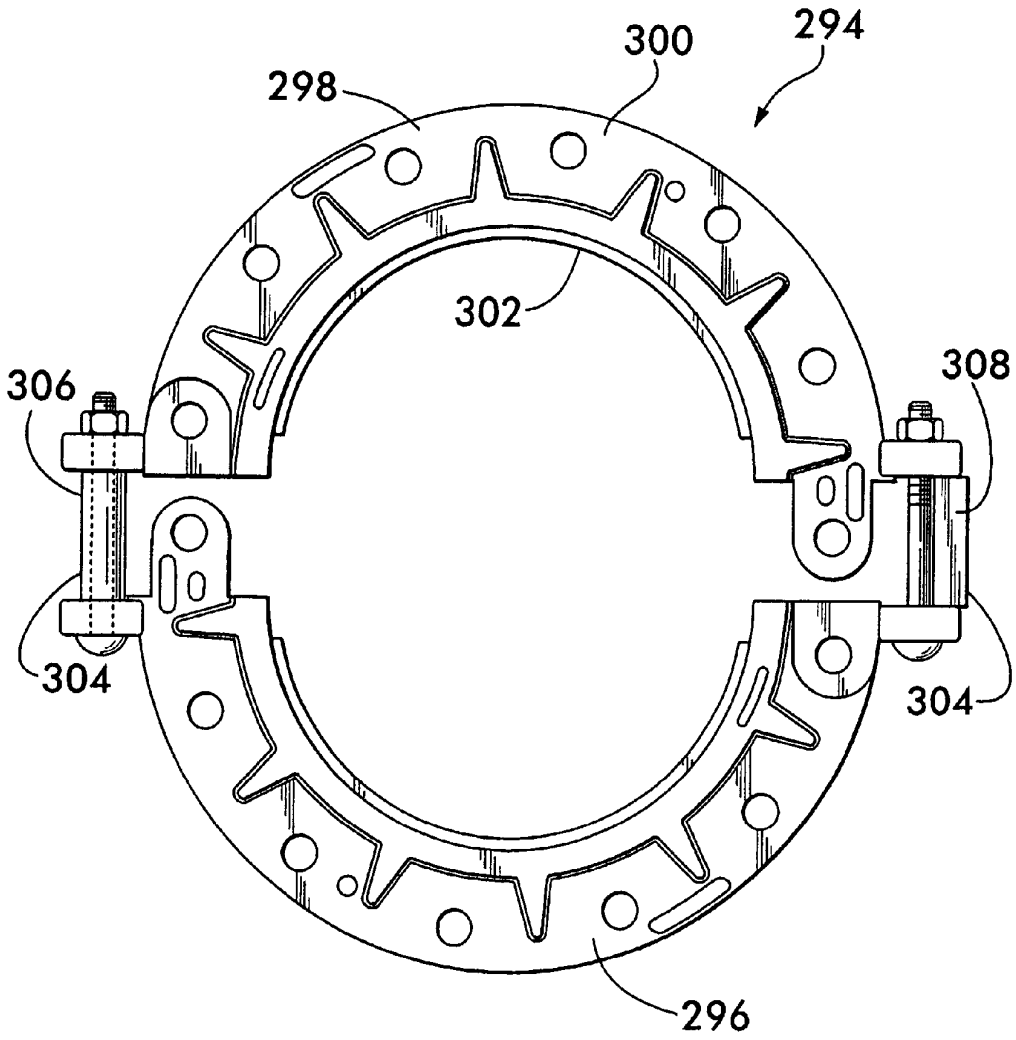


FIG. 25

DEFORMABLE MECHANICAL PIPE COUPLING

FIELD OF THE INVENTION

This invention concerns mechanical pipe couplings that are deformable to conform to pipe elements, allowing the couplings to be pre-assembled and installed as a unit.

BACKGROUND OF THE INVENTION

Mechanical couplings for joining pipe elements together end-to-end comprise interconnectable segments that are positionable circumferentially surrounding the end portions of co-axially aligned pipe elements. The term "pipe element" is used herein to describe any pipe-like item or component having a pipe like form. Pipe elements include pipe stock, pipe fittings such as elbows, caps and tees as well as fluid control components such as valves, reducers, strainers, restrictors, pressure regulators and the like.

Each mechanical coupling segment comprises a housing having arcuate surfaces which project radially inwardly from the housing and engage plain end pipe elements or circumferential grooves that extend around each of the pipe elements to be joined. Engagement between the arcuate surfaces and the pipe elements provides mechanical restraint to the joint and ensures that the pipe elements remain coupled even under high internal pressure and external forces. The housings define an annular channel that receives a gasket or seal, typically an elastomeric ring which engages the ends of each pipe element and cooperates with the segments to provide a fluid tight seal. The segments have connection members, typically in the form of lugs which project outwardly from the housings. The lugs are adapted to receive fasteners, such as nuts and bolts, which are adjustably tightenable to draw the segments toward one another.

To ensure a good fit between the couplings and the pipe elements, the arcuate surfaces on prior art couplings have a radius of curvature that is substantially matched to the radius of curvature of the outer surface of the pipe element that it is intended to engage. For couplings used with grooved pipe elements, the radii of curvature of the arcuate surfaces are smaller than the radii of curvature of the outer surfaces of the pipe elements outside of the grooves so that the arcuate surfaces fit within and engage the grooves properly.

This geometrical relation between the arcuate surfaces of the couplings and the outer surfaces of the pipe elements in prior art couplings results in a tedious and time consuming installation process when mechanical couplings are used. Typically, the coupling is received by the technician with the segments bolted together and the ring seal captured within the segments' channels. The technician first disassembles the coupling by unbolting it, removes the ring seal, lubricates it (if not pre-lubricated) and places it around the ends of the pipe elements to be joined. Installation of the ring seal requires that it be lubricated and stretched to accommodate the pipe elements, an often difficult and messy task, as the ring seal is usually stiff and the lubrication makes manual manipulation of the seal difficult. With the ring seal in place on both pipe elements, the segments are then placed one at a time straddling the ends of the pipe elements and capturing the ring seal against them. During placement, the segments engage the seal, the arcuate surfaces are aligned with the grooves, the bolts are inserted through the lugs, the nuts are threaded onto the bolts and tightened, drawing the coupling segments toward one another, compressing the seal and engaging the arcuate surface within the grooves.

As evident from the previous description, installation of mechanical pipe couplings according to the prior art requires that the technician typically handle at least seven individual piece parts (and more when the coupling has more than two segments), and must totally disassemble and reassemble the coupling. Significant time, effort and expense would be saved if the technician could install a mechanical pipe coupling without first totally disassembling it and then reassembling it, piece by piece.

SUMMARY OF THE INVENTION

The invention concerns interconnectable pipe coupling segments. Each segment is positionable straddling facing end portions of a pair of pipe elements for securing the pipe elements together in end-to-end relationship. The end portions of the pipe elements have an outer surface of substantially cylindrical profile. Each segment comprises a pair of arcuate surfaces adapted to interface with the outer surfaces of the pipe elements. The arcuate surfaces are in spaced apart relation to one another. The arcuate surfaces subtend an angle of less than 180° and having a radius of curvature greater than the radius of curvature of the outer surfaces of the pipe elements. Each segment further includes connection members for adjustably connecting one coupling segment to another. The connection members are adjustably tightenable for drawing the arcuate surfaces of the segments together. The segments are deformable upon adjustable tightening of the connection members so as to conform the curvature of the arcuate surfaces to the outer surfaces of the pipe elements.

Preferably, the segments are substantially elastically deformable, and the arcuate surfaces project radially inwardly from the segments. The connection members comprise a pair of projections extending outwardly from the ends of each of the segments. The projections are adapted to receive fasteners for adjustably connecting the segments to one another, the fasteners being adjustably tightenable for drawing the arcuate surfaces of the segments together into engagement with the outer surfaces of the pipe elements. Preferably, the projections comprise lugs having an aperture therethrough adapted to receive the fastener.

The invention also concerns a pipe coupling positionable straddling facing end portions of a pair of pipe elements for securing the pipe elements together in end-to-end relationship. Again, the end portions of the pipe elements have an outer surface of substantially cylindrical profile. The pipe coupling comprises first and second coupling segments. Each coupling segment has a pair of arcuate surfaces adapted to interface with the outer surfaces of the pipe elements. The arcuate surfaces are in spaced apart relation to one another. The arcuate surfaces subtend an angle of less than 180° and have a radius of curvature greater than the radius of curvature of the outer surfaces of the pipe elements. Each coupling segment has connection members for adjustably connecting one coupling segment to another. The connection members are adjustably tightenable for drawing the arcuate surfaces of the segments together. The segments are deformable upon adjustable tightening of the connection members so as to substantially conform the curvature of the arcuate surfaces to the outer surfaces of the pipe elements.

A pipe coupling also includes a flexible, resilient seal. The seal is preferably a substantially circular ring having an inner diameter sized to receive the pipe elements. The seal is positioned between the arcuate surfaces of the first and second coupling segments. The seal has an outer diameter sized to position the first and second coupling segments in

spaced apart relation from one another far enough to thereby allow the pipe elements to be inserted between the first and second coupling segments into end-to-end relationship. The seal is deformable when the connection members are adjustably tightened to draw the arcuate surfaces together and conform the curvature of the segments to the outer surfaces of the pipe elements.

Preferably, each of the first and second segments further comprises a pair of angularly oriented surfaces positioned adjacent to each of the connection members. The angularly oriented surfaces on each segment have opposite slopes. The angularly oriented surfaces on one segment are in facing relation with the angularly oriented surfaces on the other segment. The angularly oriented segments engage one another when the segments are drawn together and cause the segments to rotate relatively to one another about an axis substantially perpendicular to the pipe elements. The drawing together and rotation of the segments forces engagement between the arcuate surfaces and the grooves to provide rigidity about all axes of the joint.

In another embodiment, a pipe coupling comprises an arcuate band having first and second ends in substantially facing relation. The ends are spaced apart from one another. The band surrounds and defines a central space. First and second arcuate surfaces are mounted lengthwise along the band on a side thereof. The arcuate surfaces are in spaced relation alongside one another and project substantially radially inwardly into the central space. The arcuate surfaces have a radius of curvature greater than the radius of curvature of the outer surfaces of the pipe elements. The end portions of the pipe elements are insertable into the central space. Connection members are mounted on the first and second ends of the segments. The connection members are adjustably tightenable for drawing the first and second ends toward one another. The band is deformable, allowing the first and second ends to move toward one another upon adjustable tightening of the connection members. The arcuate surfaces are thereby brought into engagement with the outer surfaces of the pipe elements, their curvature substantially conforming to the curvature of the outer surfaces of the pipe elements.

Deformation of the band may be elastic, plastic, or may be facilitated by a hinge positioned between the first and second ends. The hinge allows a first portion of the band to pivot relatively to a second portion of the band for receiving the pipes within the central space.

The invention also includes a method of securing facing end portions of pipe elements together in end-to-end relationship. The method comprises the steps of:

(A) providing a pipe coupling having a plurality of coupling segments attached to one another end-to-end surrounding a central space, the coupling segments having arcuate surfaces adapted to interface with the outer surfaces of the pipes;

(B) inserting the end portions of the pipe elements into the central space; and

(C) deforming the coupling segments so as to conform the curvature of the arcuate surfaces of the coupling segments to the outer surfaces of the pipe elements.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. **1**–**1**B are longitudinal cross-sectional views of a deformable mechanical pipe coupling according to the invention;

FIGS. **2** and **3** are partial cross-sectional views of the pipe coupling shown in FIG. **1**;

FIGS. **4** and **5** are perspective views, partially cut away, of seals used with pipe couplings according to the invention;

FIGS. **6**–**7** and **8** are axial views of various pipe coupling embodiments according to the invention;

FIGS. **7**A and **9**–**13** are longitudinal sectional views of pipe coupling embodiments according to the invention;

FIG. **14** is a perspective view of a pipe coupling according to the invention;

FIG. **15** is a side view of the pipe coupling shown in FIG. **14**;

FIG. **16** is a cross-sectional view taken at line **16**—**16** in FIG. **14**;

FIG. **17** is an axial view, partially cut away, of pipe coupling embodiment according to the invention;

FIG. **18** is an axial view of a pipe coupling embodiment according to the invention;

FIG. **19** is an axial view of a pipe coupling embodiment according to the invention;

FIG. **20** is an axial view, partially cut away, of a pipe coupling embodiment according to the invention;

FIG. **21** is a partial sectional view of the pipe coupling shown in FIG. **20**;

FIG. **22** is an axial view, partially cut away, of a pipe coupling embodiment according to the invention;

FIG. **23** is an axial view of a pipe coupling embodiment according to the invention; and

FIGS. **24**–**26** are axial views of a pipe coupling embodiments according to the invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

FIGS. **1** and **2** show a pipe coupling **10** according to the invention. Coupling **10** is formed from coupling segments **12** and **14** which are interconnectable with one another to straddle end portions **16***a* and **18***a* of pipe elements **16** and **18** to secure the pipe elements together in end-to-end relationship. The end portions of the pipe elements have respective outer surfaces **20** and **22** of substantially cylindrical profile.

Interconnection of the coupling segments **12** and **14** is effected by connection members, preferably in the form of lugs **24** and **26** best shown in FIG. **2**. The lugs are preferably positioned at each end of each segment and project outwardly from the segments. Lugs **24** and **26** are positioned in facing relation to one another and adapted to receive fasteners, preferably in the form of bolts **28** and nuts **30** which are adjustably tightenable and cooperate with the lugs **24** and **26** for adjustably connecting the coupling segments to one another as discussed in further detail below.

As best shown in FIG. **1**, each segment **12** and **14** comprises a pair of arcuate surfaces **32** and **34**. The arcuate surfaces are in spaced apart relation to one another and preferably project radially inwardly toward the pipe elements **16** and **18**. The surfaces extend from a housing **36** having sidewalls **38** joined to a backwall **40**, the sidewalls and backwall forming a channel **42** that receives a seal **44**.

Examples of seals **44** are shown in FIGS. **4** and **5**. Seal **44** is preferably a flexible, resilient ring formed from elastomeric material. The seal may have lips **46** that use the internal pressure within the pipes to increase the sealing force between the seal and the outer surfaces **20** and **22** of the pipe elements **16** and **18**. As shown in FIG. **5**, seal **44** may also have a tongue **48** positioned between the lips **46**, the tongue extending circumferentially around the seal and projecting radially inwardly. Tongue **48** provides a stop surface that engages the ends of pipe elements **16** and **18** to

ensure proper positioning of the seal **44** relatively to the pipe elements as described in detail below. Engagement of the pipe elements with tongue **48** also effects alignment of the arcuate surfaces with the grooves (if present), or with alignment marks on the outside surface of the pipe elements.

As illustrated in FIG. **2**, arcuate surfaces **32** and **34** have radii of curvature **50** greater than the radii of curvature **52** of the outer surfaces **20** and **22** of pipe elements **16** and **18**. Furthermore, the arcuate surfaces **32** subtend an angle **54** of less than 180°. Angles **54** between about 40° and about 179° are practical. As a result of this arcuate surface geometry, segments **12** and **14** may be pre-assembled separated from one another such that pipe elements **16** and **18** may be inserted directly into the coupling **10** as shown in FIG. **1** without first disassembling the coupling. This feature provides a significant advantage over prior art couplings which must be assembled onto the pipe ends piece by piece. Joining of the pipe ends with a coupling **10** according to the invention proceeds much more smoothly and quickly than with prior art couplings because the technician handles fewer pieces and does not have to thread nuts onto bolts. In the embodiment shown in FIG. **1**, the seal **44** has an outer diameter **56** sized to hold the coupling segments **12** and **14** in spaced apart relation sufficient to allow the pipe ends to be inserted as described above. The seal inner diameter **58** is sized to receive the end portions **16***a* and **18***a* of the pipe elements simply by pushing the coupling over the pipe element or by inserting the pipe elements into the coupling. Other embodiments having different features for supporting the segments in spaced relation are described below.

After both pipe elements **16** and **18** are inserted into coupling **10** as shown in FIG. **1**A, nuts **30** are tightened (see also FIG. **2**). The nuts **30** cooperate with their bolts **28** to draw the arcuate surfaces **32** and **34** on segment **12** toward those on segment **14**. Tightening of the nuts exerts a force on the lugs **24** and **26** which brings the segments into contact with the pipe elements and causes the segments **12** and **14** to deform such that the radius of curvature **50** of the arcuate surfaces **32** and **34** substantially conforms to the radius of curvature **52** of the pipe elements **16** and **18**. This action is illustrated by comparing FIGS. **2** and **3** and **1**A and **1**B, wherein the gap **60** between the arcuate surfaces and the pipe outer surfaces diminishes as the arcuate surfaces are brought into engagement with the outer surfaces of the pipe ends. Deformation of the segments **12** and **14** is preferably substantially elastic, allowing the segments to spring back substantially to their original shape when the nuts **30** are loosened, thereby permitting the coupling **10** to be reused in the manner according to the invention as described herein. The segments may also be designed to have significant plastic deformation, wherein the deformation imparts a permanent set to the segments. For practical couplings, there will generally be some degree of both plastic and elastic deformation occurring in the segments as a result of tightening the fasteners. Additionally, when the segments **12** and **14** are in the undeformed state (FIG. **2**), the lugs **24** and **26** may be angularly oriented in relation to one another. Relative angles **62** up to about 10° are practical. As shown in FIG. **3**, the relative angular orientation of the lugs **24** and **26** is reduced as the segments are deformed, and the geometry may be designed such that the lugs are substantially parallel once the arcuate surfaces **32** and **34** substantially conform to the outer surfaces **20** and **22**. This is preferred because, when fully tightened, the bolt head and nut will be in substantially flat contact with the lugs, thereby avoiding induced bending moments in the bolts which can cause permanent deformation of the bolts. The seal **44** is also deformed by this process, as shown in FIG. **1**B, with the lips **46** coming into full engagement with the pipe element outer surfaces **20** and **22**. Because the seal **44** is substantially incompressible, it must be provided with space into which it may expand when compressed by the segments. This space is provided by a concavity **64** positioned in the backwall **40** between the sidewalls **38**. Concavity **64** may take virtually any practical shape and allows for volume change of the seal when it is heated or exposed to fluids thereby distributing the deformation of the seal more evenly over its circumference and mitigating the tendency of the seal to extrude outwardly from between the segments between the lugs. The concavity also prevents tongue **48**, if present, from being forced between the ends of the pipe elements and impede flow therethrough.

As shown in FIGS. **2** and **3**, for the preassembled coupling **10**, it is advantageous to hold nuts **30** in a position on bolts **28** that will maintain the segments **12** and **14** in the desired spaced apart relation as determined by contact between the segments and the seal **44**. This is conveniently accomplished by deforming the threads **29** of bolts **28**, preferably by staking. Staking the bolts hinders the rotation of the nuts and prevents them from unscrewing from the bolts under the effect of vibration, for example, during shipping, and keeps the coupling in the preassembled state with all of its parts together prior to installation. The staking is readily overcome when the nuts are tightened with a wrench.

The bending stiffness of the segments may be tuned to control the amount of force necessary to deform them in order to reduce the required assembly torque and mitigate galling between the nut and the lug. As shown in FIG. **6**, sections of increased bending flexibility **66** may be formed in the housing **36** of the segments **12** and **14** by reducing the area moment of inertia of the segment. This reduction is preferably achieved by adding one or more cut-outs **68** in either or both the backwall **40** and the arcuate surfaces **32** and **34**.

Alternately, as shown in FIG. **7**, the segments may have arcuate surfaces **32** and **34** (not shown) comprising inwardly projecting teeth **69**. Teeth **69** engage outer surfaces of the pipe elements to provide mechanical restraint, and are especially advantageous when used with plain end pipe elements. Teeth **69** may be substantially continuous, as shown on segment **14**, or intermittent, as shown on segment **12**. Single teeth, preferable for small couplings, are also feasible. As shown in FIG. **7**A, teeth **69** may also be arranged in pairs on opposite sides of the segment to increase the mechanical restraint provided by the coupling.

Although couplings according to the invention are described above as comprised of two segments, this is by way of example only. Couplings with more than two segments are feasible and preferred for larger diameter pipes due to the manufacturing costs, as reducing the size of the segments is economically advantageous. A further advantage is that the spacing between the lugs is reduced, requiring fewer turns of the nut and shorter bolts. Standard depth sockets may thereby be used during installation. FIG. **8** shows an example of a coupling embodiment **72** having four segments **74** similar to those described above.

Couplings have thus far been shown wherein all of the arcuate surfaces have substantially the same radius of curvature. Whereas such a configuration is appropriate for joining pipes having substantially the same diameter to one another, FIG. **9** shows a coupling embodiment **76** for coupling pipe elements of different diameters. Coupling **76** is formed of two segments **78** and **80** (although it may have more than two segments). Each segment has a first arcuate

surface **82** having a first radius of curvature **84**, and a second arcuate surface **86** having a second radius of curvature **88** smaller than the first radius of curvature **84**. This allows coupling **76** to join a pipe element **90** having a larger diameter to a pipe element **92** having a smaller diameter. Analogous to the couplings described above, the radius of curvature **84** is greater than the radius of curvature of the outer surface of pipe element **90**, and the radius of curvature **88** is greater than the radius of curvature of the pipe element **92**. This geometric relationship allows the pipe elements **90** and **92** to be inserted into a pre-assembled coupling **76** and achieve the advantages of the invention. The coupling segments **78** and **80** deform upon the application of force by adjustable connection members to conform the radii of curvature to the outer surface of the pipe elements.

In a preferred embodiment, shown in FIG. **10**, the inwardly projecting arcuate surfaces **32** and **34** of coupling **10** engage grooves **94** formed in the outer surfaces **20** and **22** of pipe element end portions **16***a* and **18***a*. Interaction between the arcuate surfaces **32** and **34** with their respective grooves **94** permits the coupling to provide relatively high end restraint to withstand forces caused by internal pressure or external loads. To obtain higher end restraint, it is found useful to add a second set of arcuate surfaces that interact with a second set of grooves in the pipe elements. This embodiment is illustrated in FIG. **11**, wherein a coupling **96** is comprised of segments **98** and **100**, each segment having two pairs of arcuate surfaces **102** and **104** that project inwardly from the segments. The arcuate surface pairs are in substantially parallel, spaced relation to one another and engage pairs of grooves **106** in the surfaces of the pipe elements **108** and **110** which they connect together.

In another embodiment, shown in FIG. **12**, couplings according to the invention such as **10** may be used with pipe elements **112** and **114** having raised circumferential shoulders **116** that are engaged by the arcuate surfaces **32** and **34** of the segments **12** and **14**. Alternately, as shown in FIG. **13**, a coupling **118** according to the invention having segments **120** and **122** with respective arcuate surfaces **124** and **126** is used with pipe elements **128** and **130** having flared end portions **132** and **134**. Note that in the example embodiments shown in FIGS. **9**–**13**, the seal **44** has the tongue **48** which is effectively used to position the pipe ends within the coupling upon insertion, the tongue acting as a pipe stop to aid in locating the pipe ends at the proper depth within the couplings.

Another coupling embodiment **136** is shown in FIG. **14**. Coupling **136** is comprised of two segments **138** and **140** from which lugs **142** and **144** extend, the lugs cooperating with fasteners **146** to act as connection members for adjustably connecting one coupling segment to another. As described above, each segment has a pair of arcuate surfaces **148**, **150**, each preferably projecting radially inwardly from the segments. The arcuate surfaces subtend an angle **152** less than 180° and have a radius of curvature **154** greater than the radius of curvature of the pipe elements which the coupling is to join together. Anti-rotation teeth **70** are positioned adjacent to the arcuate surfaces and project radially inwardly to engage the pipe elements and provide torsional rigidity.

As best shown in FIG. **14**, each segment **138** and **140** has a pair of angularly oriented surface portions **156** and **158** located adjacent to each of the lugs **142** and **144**. As illustrated, the slope of surface portion **156** may be opposite to the slope of surface portion **158** on each segment. (Both surfaces could also be sloped in the same direction as well.) This opposite slope relationship between the surfaces on a segment results in surfaces having compatible slopes being positioned in facing relation in a pre-assembled coupling as shown in FIG. **15**. When the fasteners **146** are tightened, conforming the arcuate surfaces to the outer surfaces of the pipe elements, the angular surface portions **156** and **158** on each segment engage and slide relatively to one another, causing the segments to draw together and rotate relatively to one another in opposite directions about an axis **160** oriented substantially perpendicularly to the axis of the pipe elements being joined. These motions of the segments **138** and **140** causes the arcuate surfaces **148** and **150** to engage grooves in the pipe elements and adds rigidity to all axes of the joint as previously described. For coupling segments having surface portions with the same slopes, the couplings move along the pipe in opposite directions relatively to one another with similar effect.

As shown in cross section in FIG. **16**, the segments **138** and **140** forming the coupling **136** have a channel **162** defined by a housing **164**. The housing is formed from a back wall **166** and sidewalls **168**, and receives a seal **170** which is sized to position the segments **138** and **140** in spaced apart relation so as to allow insertion of pipe elements into the pre-assembled coupling shown in FIG. **14**. A concavity **172** is provided in the back wall to provide a space for volume change of the seal when it is heated or exposed to fluids as well as to prevent tongue **48** from being forced between the ends of the pipe elements and impede flow therethrough due to compression of the seal.

In another coupling embodiment, shown in FIG. **17**, the coupling **174** again is comprised of at least two coupling segments **176** and **178**, each having inwardly projecting arcuate surfaces **180** as described above. However, arcuate surfaces **180** have notches **182** and **184** positioned at opposite ends. The notches **182** and **184** provide clearance at the 3 o'clock and 9 o'clock positions of the coupling where it is most needed to permit pipe elements to be inserted into the pre-assembled coupling **174**. The availability of increased clearance at these locations allows the coupling segments **176** and **178** to be spaced closer to one another in the pre-assembled configuration than would be the case if the clearance was not available at the ends of the surfaces. By having the segments of the preassembled coupling closer together, the amount of deformation required to conform the arcuate surfaces to the pipe element outer surface is reduced and thereby the energy required to tighten the fasteners.

Another coupling embodiment **192** according to the invention is shown in FIG. **18**. Coupling **192** comprises an arcuate band **194** surrounding a central space **196**. Band **194** has opposite ends **198** and **200** positioned in facing relation to one another. Ends **198** and **200** are in spaced relation in the pre-assembled coupling and have connection members mounted thereon, preferably in the form of projecting lugs **202** and **204** adapted to receive a fastener such as bolt **206** and nut **208**. The bolt and nut cooperate with the lugs to deform the band **194** and bring the ends **198** and **200** toward one another after pipe elements have been inserted into the central space **196** for coupling in end-to-end relationship. Band **194** has a pair of arcuate surfaces **210**, only one of which is visible in the figure. The arcuate surfaces are in spaced relation lengthwise of one another as illustrated in FIG. **10** and described above for other embodiments. The arcuate surfaces **210** have a greater radius of curvature than the outer surface of the pipe ends that the coupling is to join together. This geometric configuration, and the separation of the ends **198** and **200** allows the pipe elements to be inserted into central space **196**. Upon tightening of the nut **208** the band **194** is deformed such that the radius of curvature of the arcuate surfaces **210** are forced to conform with the radius

of curvature of the outside surface of the pipe elements which they engage. Note that in the preassembled state, projecting lugs **202** and **204** are preferably angularly oriented with respect to one another, having a relative angle **212** up to about 20°. Tightening of the fastener draws the lugs toward each other, and results in decreasing the relative angle **212**, preferably to the point wherein the lugs are substantially parallel to one another. This is particularly advantageous for a flexible coupling which does not depend upon the pipe elements to form a reaction point to cause the deformation in combination with the bolts, the friction incurred at the reaction points inhibiting flexibility.

Coupling **192** includes a seal **214** positioned within the band **194** between the arcuate surfaces **210**. Seal **214** may be similar to those illustrated in FIGS. **4** and **5** and sized to receive the pipe elements for creating a fluid tight seal when the band is deformed.

The bending flexibility of coupling **192** may be adjusted by reducing the area moment of inertia of band **194**. Such adjustments may be effected by positioning cut-outs **216** in the band. Alternately, as shown in FIG. **19**, a hinge **218** may be provided between the ends **198** and **200**. Hinge **218** is preferably positioned equidistant from the ends of the band and provides infinite bending flexibility, reducing the torque needed on the fastener to draw the ends **198** and **200** toward one another. The band **194** will still deform as the arcuate surfaces **210** engage the outer surfaces of pipe elements to conform the radii of the surfaces with that of the pipe element outer surfaces. When the hinge is present, the seal **214** is sized so as to maintain the lugs **202** and **204** in spaced relation so that pipe elements may be inserted. For both the hinged and hingeless versions of the coupling described above, the arcuate surfaces preferably project radially inwardly from the band and may have different radii of curvature from each other, as illustrated in FIG. **9**, to allow the coupling **192** to be used to join pipes having different diameters.

FIG. **20** illustrates a pre-assembled coupling **220** that does not depend on the seal **222** to maintain its segments **224** and **226** in spaced apart relation and ready to receive pipe elements such as **228**. Coupling **220** has spacers **230** that extend between segments **224** and **226** and maintain the segments in spaced apart relation. In this example embodiment, the spacers **230** comprise collapsible tubes **232** that are positioned between facing lugs **234** and **236** that extend from the segments. Tubes **232** are preferably thin walled and circular in cross section and are arranged coaxially surrounding the fasteners **238**. The tubes may be made of lightweight metal or a polymer material such as polypropylene and may have score lines **240** in their surface to create weakened regions that facilitate collapse of the tube under compressive loads applied by the fasteners **238**. Other materials, such as cardboard and rubber are also feasible. The tubes are designed to be strong enough to support the segments in spaced relation during shipping, handling and installation, but collapse at a predetermined compressive load that a technician may apply, preferably by manually tightening the fasteners with a wrench.

In use, pipe elements to be joined end-to-end are inserted between the segments **224** and **226**. Fasteners **238** are then tightened to draw the segments toward each other and into engagement with the pipe elements. Tightening of the fasteners places the tubes **232** under a compressive load, and the tubes buckle and collapse as shown in FIG. **21** when the predetermined load is achieved to allow the segments to move toward one another and engage the pipe elements to effect the joint.

Spacers positioned between the segments may be used with any type of mechanical coupling. Note that in FIGS. **20** and **21**, the segments **224** and **226** have arcuate surfaces **242** with a radius of curvature that is substantially the same as the radius of curvature of the outer surface of pipe element **228** which they are designed to engage. To provide clearance between the pipe element **228** and the segments allowing the pipe element to be inserted into the coupling while still maintaining a reasonable fastener length, notches **244** and **246** are positioned at opposite ends of the arcuate surfaces **242** as best shown in FIG. **20**. The notches provide clearance at the 3 o'clock and 9 o'clock positions of the coupling to permit pipe elements to be inserted into the pre-assembled coupling **220**.

FIG. **22** illustrates another coupling embodiment **254** having spacers **230** between segments **256** and **258** comprising the coupling. In this example, the spacers **230** comprise tubes **260** again positioned coaxially with fasteners **262** and between facing lugs **264** and **266** projecting from the segments. Tubes **260** have corrugations **268** which facilitate their collapse when compressive load is applied by tightening the fasteners. Note that the segments **256** and **258** are similar to those described above with respect to FIGS. **1** and **2**, wherein the arcuate surfaces of the segments have a greater radius of curvature than the pipe elements.

Another example of a spacer for maintaining coupling segments in spaced relation is shown in FIG. **23**. Coupling **270** is comprised of segments **272** and **274** having outwardly projecting lugs **266** and **268** positioned in facing relation when the coupling is pre-assembled. The segments are held together by fasteners **280** extending between the lugs. Spacers **282**, preferably in the form of block-shaped bodies **284**, are positioned between the lugs **266** and **268**. The bodies **284** are removable from between the lugs to allow the fasteners to be tightened and draw the segments into engagement with pipe elements being joined.

Bodies **284** may be releasably attached to the segments, for example, held by friction between the lugs **266** and **268**. Flexible, resilient materials are particularly advantageous for forming the bodies because bodies made from such materials provide adequate strength and stiffness to maintain the couplings in spaced apart relation during rough handling but may be readily deformed for easy removal as required. If polymer materials are used to form the bodies they may be adhered to the lugs by heat fusing or by adhesives which afford a releasable bond between the bodies and the segments.

FIG. **24** illustrates a non-deformable coupling embodiment **286** that uses spacers **288** to maintain coupling segments **290** and **292** in spaced apart relation so that pipe elements may be inserted between them in the preassembled state shown. Coupling **286** has no notches or other features that provide clearance facilitating inserting pipe elements into end to end relation between the segments, but relies on the spacers to provide sufficient separation for adequate clearance. The spacers **288** may be similar to those described above.

Spacers according to the invention may also be used with various other types of couplings. As shown in FIG. **19**, a spacer **288** may be used with the hinged coupling embodiment **192** to keep the lugs **202** and **204** in spaced apart relation so that pipe elements may be inserted. Although a tubular spacer is illustrated, it is understood that any of the spacers described herein are feasible for use with this coupling.

FIG. **25** illustrates an adapter coupling **294** for joining flanged pipe to non-flanged pipe, for example, grooved or

plain end. Coupling **294** comprises coupling segments **296** and **298**, each of which has a radially extending flange **300** on one side and a arcuate surface **302** on the opposite side. Segments **296** and **298** are held in spaced apart relation by spacers **304**, which may comprise a collapsible tubular spacer **306** or a removable spacer **308**, or other types of spacers described herein.

FIG. **26** illustrates further types of spacer embodiments **310** feasible for maintaining coupling segments **312** and **314** in spaced apart relation. Spacers **310** comprise spring elements which deform, preferably substantially elastically, when subjected to a compression force by the fasteners **316**. Spring elements may take any of a number of forms, for example, a rubber cylinder **318** or a coil spring **320**. The use of spring elements for spacers allows for fine control of the forces required to draw the segments toward one another and also facilitates the reuse of the couplings when the deformation of the spring elements is substantially elastic.

It is anticipated that deformable couplings may also include features such as the tongue and recess disclosed in U.S. Pat. Nos. 6,170,884 and 6,302,450; outlets incorporated within a segment as disclosed in U.S. Pat. No. 3,362,730; plain end couplings that do not use grooves as disclosed in U.S. Pat. Nos. 2,439,979, 3,024,046, 5,911,446 and 6,302,450, all of these patents being hereby incorporated by reference herein.

Deformable mechanical pipe couplings according to the invention provide for rapid and sure installation creating a pipe joint while avoiding the need to partially or totally disassemble and then reassemble the coupling and handle the individual piece parts.

What is claimed is:

1. A method of securing facing end portions of pipe elements together in end-to-end relationship, wherein said end portions of said pipe elements have an outer surface of substantially cylindrical profile, said method comprising the steps of:

providing a pipe coupling having a plurality of coupling segments attached to one another end-to-end surrounding a central space, said coupling segments having arcuate surfaces adapted to interface with the outer surfaces of said pipes;

inserting said end portions of said pipe elements into said central space; and

deforming said coupling segments so as to conform the curvature of said arcuate surfaces of said coupling segments to said outer surfaces of said pipe elements.

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